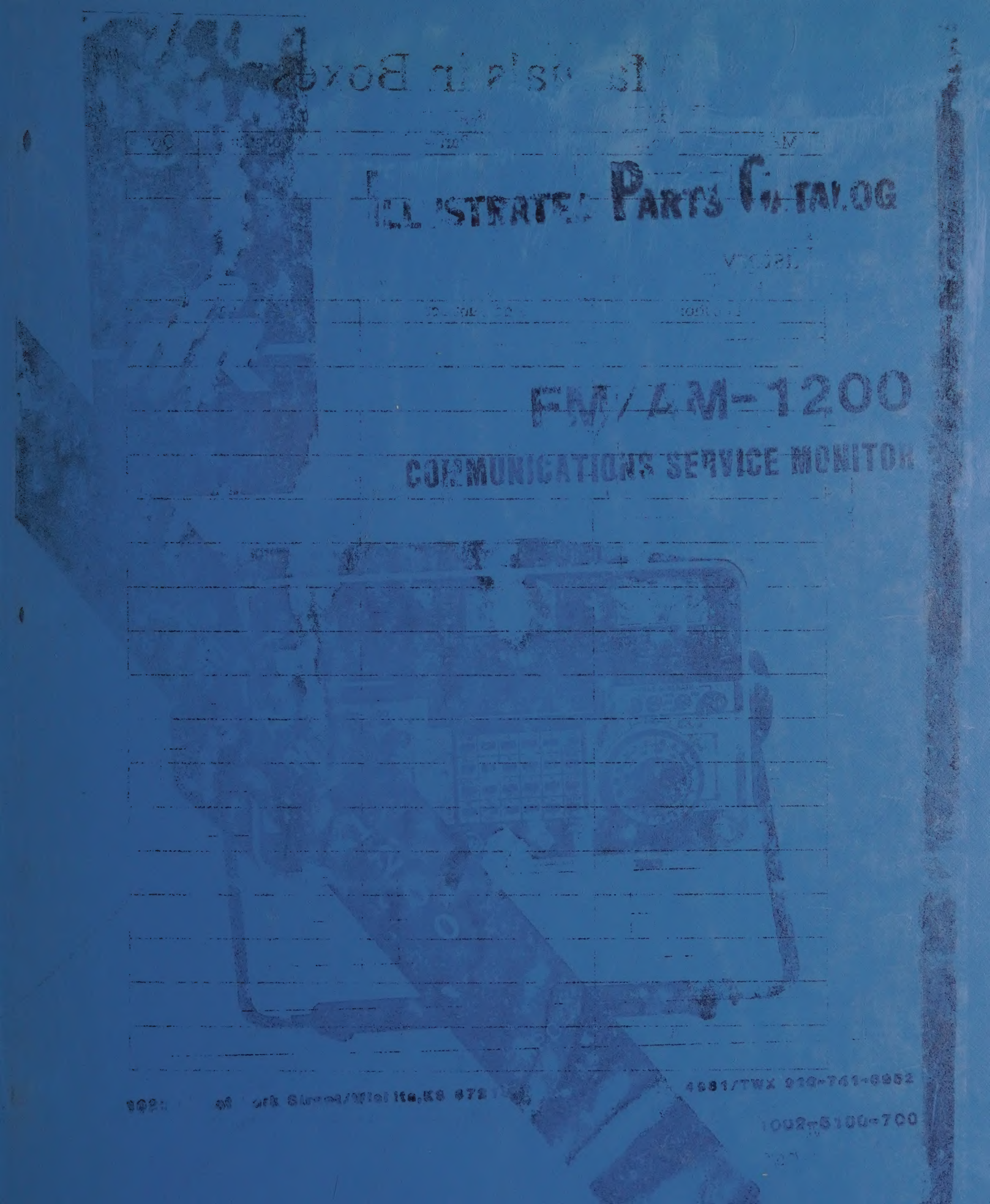
ELECTRONIC PARTS CATALOG

FM/LM-1200

COMMUNICATIONS SERVICE MONITOR



4881/TWX 910-741-6952

1002-5100-700

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HEATHKIT® MANUAL

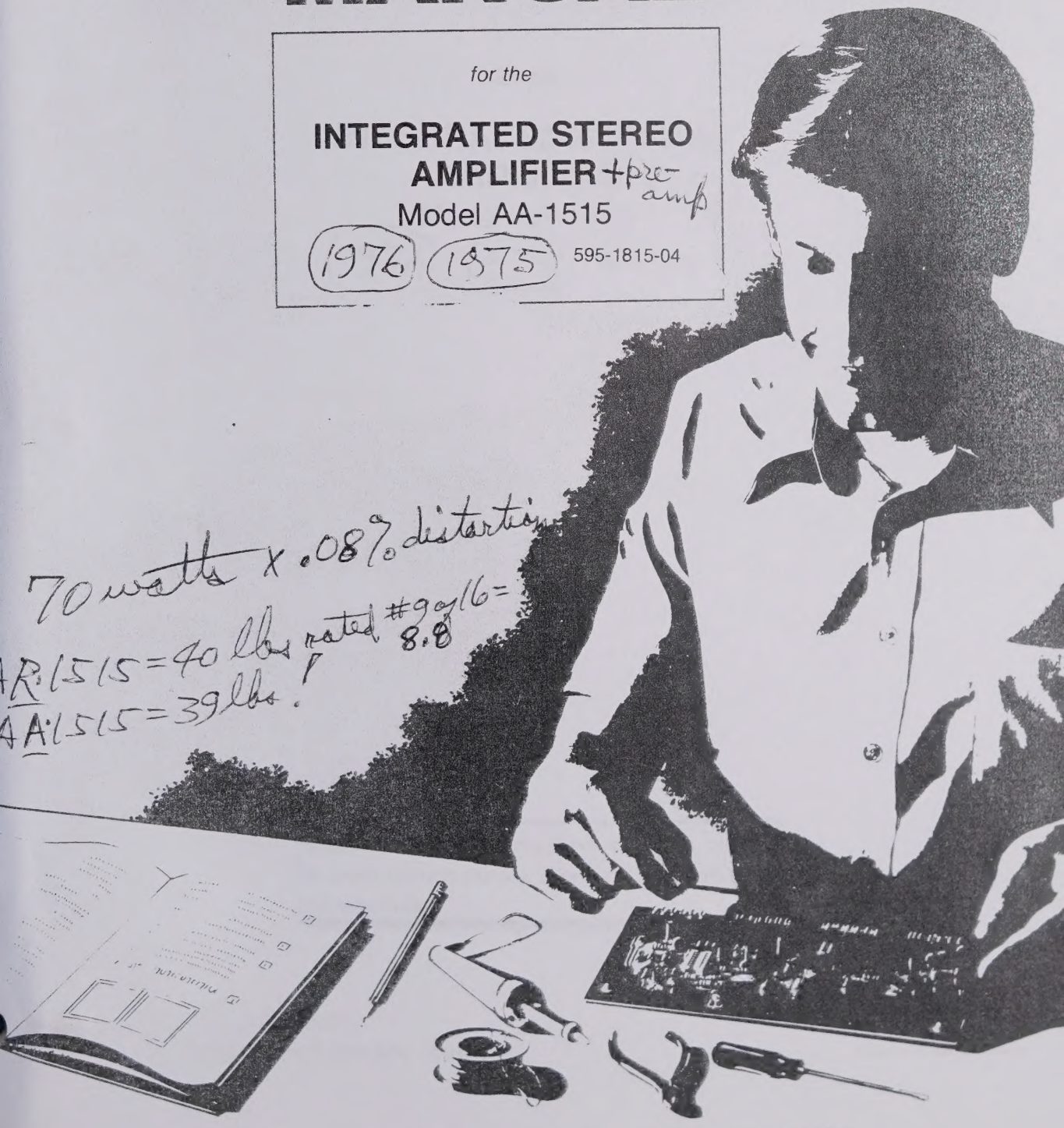
for the

INTEGRATED STEREO AMPLIFIER + pre amp

Model AA-1515

1976 1975

595-1815-04



70 watts x .08% distortion

AR-1515 = 40 lbs rated #9 of 16 = 8.8

AA-1515 = 39 lbs.

HEATH COMPANY • BENTON HARBOR, MICHIGAN

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Heathkit® Manual

for the

INTEGRATED STEREO AMPLIFIER + pre-amp

Model AA-1515

1976 1975 595-1815-04

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS INSTRUMENT TO RAIN OR MOISTURE.

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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UNPACKING INSTRUCTIONS

DO NOT UNPACK YOUR AMPLIFIER PARTS UNTIL YOU ARE INSTRUCTED TO DO SO.

The amplifier packaging consists of the main carton which contains a small carton marked Packs 1-6, and a number of loose parts, some of which are wrapped. These loose parts will be considered the Final Pack even though they may not be marked " Final Pack." NEVER UNPACK MORE THAN ONE PACK AT A TIME.

The carton marked Packs 1-6 contains a "Pack Index Sheet," hardware, and the parts for the circuit boards. The "Pack Index Sheet " identifies the location of each pack in the carton. Do not unpack the entire carton at one time. Refer to the "Pack Index Sheet" when the Manual instructs you to locate a certain pack.

Return any part, or group of parts, that is packaged in a bag or envelope with a part number to its container after you identify it and leave it there until you actually use it in a step. This will prevent intermixing of parts and aid in part identification.

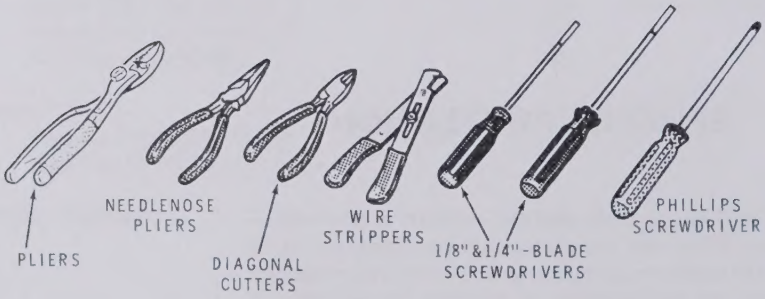
SPEAKER PROTECTION

Before you use any audio amplifier — Heath or otherwise — you must contact the manufacturer of your speakers, or his authorized distributor or dealer, to learn what type of speaker protection will be necessary to minimize the possibility of damage to your speakers. Do this **now** so that, as soon as you have assembled this Amplifier, you can then immediately connect it to your speaker system to see how the unit operates. If you have not installed proper protection by that time, you could seriously damage your speakers during initial testing or use. Refer to Page 99.

ASSEMBLY NOTES

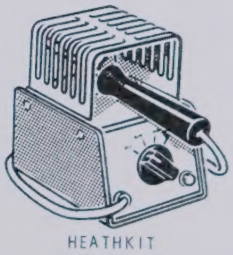
TOOLS

You will need these tools to assemble your kit.

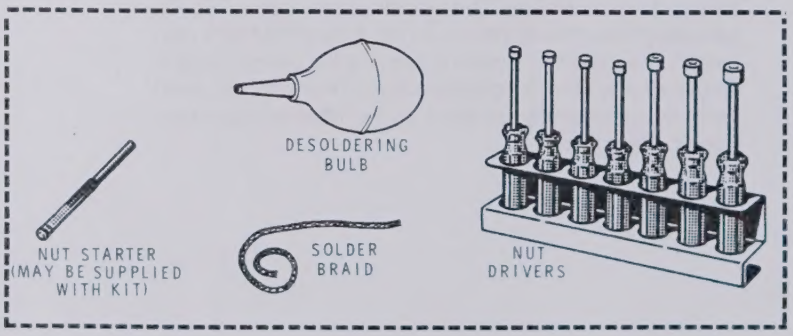


PENCIL SOLDERING IRON
(25 TO 40 WATTS)

OR



HEATHKIT SOLDERING IRON



ASSEMBLY

1. Follow the instructions carefully, and read the entire step before you perform the operation.

2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.

3. Position all parts as shown in the Pictorials.

4. A separate "Illustration Booklet" contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. The Pictorials will be called out in the Step-by-Step Assembly as "Refer to Pictorial 3 in the Illustration Booklet for the following steps." The illustrations are arranged in Pictorial number sequence. Place the Booklet in a convenient location and keep it with the Assembly Manual.

5. Solder a part or a group of parts only when you are instructed to do so.

6. Resistors will be called out by their resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms), and color code. Use 1/2-watt resistors unless directed otherwise.

7. Capacitors will be called out by their capacitance value (in pF or μF) and type (ceramic, Mylar*, or electrolytic).

8. Each circuit part in this kit has its own component number (R2, C4, etc). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

   — In the Parts List,

   — At the beginning of each step where a component is installed,

   — In some illustrations,

   — In the Schematic,

   — In the sections at the rear of the Manual.

9. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

10. A large number of individual wires and shielded cables is used in this kit to make sure that it meets specifications. Connect and route the wires and cables carefully.

SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.

*DuPont Registered Trademark

PARTS LIST

The following pages contain several parts lists, one for each major section of this kit (Chassis, Tone Circuit Board, etc.). Check the parts and assemble this kit in the following manner:

1. Remove the carton marked Packs 1-6 and open it.
2. Refer to the "Pack Index Sheet" inside the carton and check the Pack #1 parts against the "Chassis" parts list. (The parts lists have "key numbers." These correspond to parts drawings in the "Illustration Booklet.")
3. Proceed to the Step-by-Step Assembly, as directed at the end of the parts list.
4. After you complete the Step-by-Step Assembly, return, as directed, to the next parts list.
5. Repeat the process for each parts list and Step-by-Step Assembly section.

Any part that is packaged in an individual envelope with a part number on it should be placed back in the envelope after you identify it until it is called for in a step. Do not throw away any package material until all the parts are accounted for.

To order a replacement part, always include the part number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, use one of the "Expedited Parts Order Forms" at the rear of this Manual or refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

CHASSIS

Refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack Pack #1.

RESISTORS

1/2-Watt, 5%

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	6-103	1	10 kΩ (brown-black-orange)	R3
A1	6-153	1	15 kΩ (brown-green-orange)	R2
A1	6-334	1	330 kΩ (orange-orange-yellow)	R1

CAPACITOR

A2	21-70	1	.01 μF disc	C1

DIODES-SWITCHES

A3	56-56	1	1N4149 diode	D1
A4	57-67	1	10A20 bridge rectifier	BR1
A5	60-2	1	DPDT slide switch	SW3
A6	60-20	1	TPDT slide switch	SW2
A7	64-743	1	DPDT pushbutton switch	SW1

INSULATORS

B1	73-3	6	Rubber grommet
B2	73-34	1	Alligator clip insulator
B3	75-20	2	Small insulator plate
B4	75-141	1	Large insulator plate
B5	75-71	1	Strain relief
B6	75-706	2	Circuit board standoff

BRACKETS-RAIL-PLATES

C1	204-2202-1	1	Test switch bracket
C2	204-2109	1	Power switch bracket
C3	205-806	1	Connector plate

SHIELDS-CONNECTORS

C4	432-180	1	6-pin connector
C5	432-156	2	4-pin shell
C6	432-873	8	Female pin connector

SOCKETS

D1	432-872	2	Speaker socket
D2	434-82	2	2-phono socket assembly
D3	434-241	1	14-phono socket assembly
D4	434-304	2	Power socket

HARDWARE

Hardware packets are marked to show the size of the hardware they contain (HDW #4, or HDW #2 and #6, etc.). You may have to open more than one packet - in this pack - to locate all the hardware of any one (#6, for example) size.

#3 - #4 Hardware

D5	250-49	3	3-48 × 1/4" screw
D6	252-1	3	3-48 nut
D7	254-7	3	#3 lockwasher
D8	250-391	2	4-40 × 5/16" black screw
D9	252-2	2	4-40 nut
D10	254-9	2	#4 lockwasher

#6 Hardware

E1	250-56	4	6-32 × 1/4" screw
E2	250-276	6	6-32 × 3/8" black flat head screw
E3	250-381	36	6-32 × 3/8" black screw
E4	250-1227	10	#6 × 3/8" black sheet metal screw
E5	250-11	2	6-32 × 1/2" flat head screw
E6	250-325	3	6-32 × 5/8" screw
E7	252-3	42	6-32 nut
E8	252-23	1	6-32 thumbnut
E9	253-2	2	#6 fiber shoulder washer
E10	253-60	3	#6 flat washer
E11	254-1	40	#6 lockwasher
E12	259-1	5	#6 solder lug

#8 Hardware

F1	252-4	4	8-32 nut
F2	254-2	3	#8 lockwasher
F3	259-24	3	#8 long solder lug

Other Hardware

F4	259-5	1	#10 solder lug

MISCELLANEOUS

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
	85-1831	1	Switch circuit board	
	346-21	6"	Teflon sleeve	
F5	207-22	1	Plastic clamp	
F6	260-16	2	Alligator clip	
F7	421-6	1	3-ampere, slow-blow fuse	
F7	421-3	1	2-ampere slow-blow fuse	
F8	423-11	1	Fuseholder	
F9	432-67	1	Wire nut	
F10	455-54	2	Nylon bearing	
F11	490-112	1	Pin extractor	
F12	490-5	1	Nut starter	

PARTS FROM FINAL PACK

G1	25-813	2	10,000 μF electrolytic capacitor	C2, C3
	89-56	1	Line cord	
	134-278	1	15-connector socket with wires	
	75-737	1	6" × 8" insulating paper	
G2	200-1236	1	Power supply chassis	
G3	203-1701	1	Right side panel	
G4	203-1702	1	Left side panel	
G5	203-1827	1	Front subpanel	
G6	203-1847-1	1	Rear panel	
G7	204-2160	2	Circuit board rail	

Wire

340-1	18"	Large bare
344-3	60"	Large red stranded
344-16	30"	Medium red stranded

Wire (cont'd.)

344-92	24"	Small red stranded
344-52	24"	Red solid
344-15	90"	Medium black stranded
344-90	24"	Small black stranded
344-50	102"	Black solid
344-29	24"	Large blue stranded
344-56	6"	Blue solid
344-30	42"	Large orange stranded
344-79	42"	Medium brown stranded
344-51	30"	Brown solid
344-82	42"	Medium white stranded
344-28	24"	Large yellow stranded
344-45	24"	Large gray stranded

Miscellaneous

	54-916	1	Power transformer
G8	207-2	2	Capacitor clamp
G9	407-736	1	Meter
G10	354-8	1	Line cord tie
			Solder

Printed Material

NOTE: Be sure you refer to the number on the blue and white label in any communications you may have with the Heath Company about this kit.

390-1525	1	Patent label
391-34	1	Blue and white label
597-260	1	Parts Order Form
597-308	1	Kit Builders Guide
	1	Manual (see front cover for part number).

Proceed to Page 16 and begin the assembly of the chassis. Do **not** unpack any more of your kit until you are instructed to do so.

POWER SUPPLY/MUTING CIRCUIT BOARDS

When you are directed to this section in a specific step, refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack Pack #2. Then check these parts against the following list.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTORS, 5%				
NOTE: The following resistors have a gold fourth band.				
A1	6-103	1	10 kΩ (brown-black-orange)	R54
A1	6-393	1	39 kΩ (orange-white-orange)	R53
A1	6-104	1	100 kΩ (brown-black-yellow)	R52
A1	6-474	1	470 kΩ (yellow-violet-yellow)	R51
CAPACITORS				
A2	21-16	6	.01 μF disc	C501-C504, C507, C508
H1	25-220	1	10 μF tantalum	C51
H2	25-121	2	500 μF electrolytic	C505, C506
H2	25-230	1	2000 μF electrolytic	C509
DIODES				
A3	56-56	1	1N4149	D51
A3	57-65	7	1N4002	D52, D501-D506

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
MISCELLANEOUS				
NOTE: Transistors are marked for identification in one of the following four ways:				
			1. Part number.	
			2. Type number.	
			3. Part number and type number.	
			4. Part number with a type number other than the one listed.	
J4	417-801	3	MPSA20 transistor	Q51-Q53
H3	432-124	6	Circuit board connector	
H4	69-81	1	Relay	RY51
PARTS FROM FINAL PACK				
	85-1653-2	1	Power supply circuit board	
	85-1812-1	1	Muting circuit board	

Proceed to Page 32 and assemble the power supply circuit board. Do not unpack any more of your kit until you are instructed to do so.

METER AMPLIFIER CIRCUIT BOARD

When you are directed to this section in a specific step, refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack Pack #3. Then check these parts against the following list.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTORS, 5%				
NOTE: The following resistors have a gold fourth band.				
A1	6-471	2	470 Ω (yellow-violet-brown)	R402, R414
A1	6-182	1	1800 Ω (brown-gray-red)	R408

KEY No.	HEATH Part No	QTY.	DESCRIPTION	CIRCUIT Comp No.
Resistors (Cont'd.)				
A1	6-103	4	10 kΩ (brown-black-orange)	R401, R403 R413, R415
A1	6-823	2	82 kΩ (gray-red-orange)	R406, R418
A1	6-124	2	120 kΩ (brown-red-yellow	R405, R416
A1	6-184	2	180 kΩ (brown-gray-yellow)	R404, R417

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
OTHER RESISTORS				
A1	6-474	2	470 kΩ, (yellow-violet-yellow)	R411, R422
J1	2-292	2	500 Ω, 1%	R409, R419
J1	2-195	2	1170 Ω (1.17k), 1%	R407, R421
J1	2-661-12	1	6570 Ω (6.57k), 1%	R225
J1	2-674-12	1	40 kΩ, 1%	R224
CAPACITORS				
J2	27-147	2	.0056 μF Mylar*	C404, C411
J2	27-137	2	.02 μF Mylar	C403, C409
A2	21-199	2	.1 μF disc	C402, C408
J3	25-149	2	5 μF electrolytic	C401, C407
J3	25-257	3	10 μF electrolytic	C405, C406, C412
DIODES				
A3	56-56	8	1N4149	D401, D402, D403, D404, D405, D406, D407, D408
A3	56-36	1	VR-16.1G zener	ZD407

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
MISCELLANEOUS				

NOTE: Transistors are marked for identification in one of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one listed.

J4	417-801	6	MPSA20 transistor	Q401, Q402, Q405, Q406, Q407, Q410
J4	417-882	4	MPSA20 (selected) transistor	Q403, Q404, Q408, Q409
J5	432-134	7	Wire connector	
J6	432-755	1	Circuit board socket	
J7	10-390	2	20 kΩ control	R412, R423
PART FROM FINAL PACK				
	85-1871-2	1	Meter amplifier circuit board	

Proceed to Page 36 and assemble the meter amplifier circuit board. Do not unpack any more of your kit until you are instructed to do so.

*DuPont Registered Trademark.

PREAMPLIFIER CIRCUIT BOARD

When you are directed to this section in a specific step, refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack the parts from Pack #4. Then check these parts against the following list.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTORS, 5%				

NOTES:

1. The following resistors are 5% (gold fourth band). 10% resistors have a silver fourth band.
2. The resistors may be packed in more than one envelope. Open all the resistor envelopes in this pack before you check them against the Parts List.

A1	6-330	2	33 Ω (orange-orange-black)	R114, R122
A1	6-101	6	100 Ω (brown-black-brown)	R102, R103, R104, R105, R135, R147

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Resistors (cont'd.)				
A1	6-102	4	1000 Ω (brown-black-red)	R126, R133, R138, R146
A1	6-392	2	3900 Ω (orange-white-red)	R131, R143
A1	6-472	2	4700 Ω (yellow-violet-red)	R101, R106
A1	6-622	4	6200 Ω (blue-red-red)	R136, R13 R148, R14
A1	6-103	2	10 kΩ (brown-black-orange)	R128, R142
A1	6-273	4	27 kΩ (red-violet-orange)	R132, R134, R144, R145

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Resistors (cont'd).				
A1	6-473	2	47 kΩ (yellow-violet-orange)	R107, R121
A1	6-823	2	82 kΩ (gray-red-orange)	R129, R141
A1	6-274	4	270 kΩ (red-violet-yellow)	R109, R115, R118, R125
A1	6-514	2	510 kΩ (green-brown-yellow)	R127, R139
OTHER RESISTORS				
K1	1-21-1	2	680 Ω, 1-watt, 10% (blue-gray-brown)	R116, R117
J1	2-739-12	2	1250 Ω, 1% (1.25K)	R108, R119
J1	2-124	2	80 kΩ, 1%	R112, R124
J1	2-14	2	1 MΩ, 1%	R113, R123
CAPACITORS				
Disc				
A2	21-157	2	5 pF	C124, C129
A2	21-111	2	15 pF	C108, C121
A2	21-40	2	47 pF	C102, C115
A2	21-176	2	.01 μF	C107, C119
A2	21-195	2	.1 μF	C109, C114
Electrolytic				
J3	25-820	6	10 μF (nonpolar)	C101, C106, C112, C122, C126, C133
H1	25-281	2	38 μF tantalum (39m)	C103, C117
J3	25-117	4	100 μF (15V or higher)	C125, C127, C131, C132
H2	25-146	2	100 μF (30V or higher)	C111, C113

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Other Capacitors				
K3	29-20	2	.001 μF (1000) polystyrene	C105, C118
K3	29-39	2	.003 μF (3000) polystyrene	C104, C116
J2	27-145	2	.22 μF Mylar	C123, C128

DIODES-TRANSISTORS-INTEGRATED CIRCUIT

NOTE: Transistors and integrated circuits are marked for identification in one of the following four ways:

1. Part number.
2. Type number. (On integrated circuits this refers only to the numbers; the letters may be different or missing.)
3. Part number and type number.
4. Part number with a type number other than the one shown.

A3	56-620	2	17mA, 15V zener diode	ZD101, ZD102
K4	417-235	2	2N4121 transistor	Q103, Q107
J4	417-283	2	SM07275 transistor	Q104, Q108
J4	417-284	4	SM62186 transistor	Q101, Q102, Q105, Q106
K5	442-615	1	UA739 integrated circuit (selected)	IC101

MISCELLANEOUS

K6	252-7	2	Control nut	
K7	259-10	4	Control solder lug	
K8	434-267	1	14-pin socket	
K9	63-1248	1	1-wafer rotary switch	SW102
	344-7	18"	Large black stranded wire	

PARTS FROM FINAL PACK

K10	63-1249	1	4-wafer rotary switch	SW101
	85-1695-4	1	Preamplifier circuit board	

Proceed to Page 40 and assemble the preamplifier circuit board. Do not unpack any more of your kit until you are instructed to do so.

TONE CIRCUIT BOARD

When you are directed to this section in a specific step, refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack the parts from Pack #5. Then check these parts against the following list.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTORS, 5%				
The resistors may be packed in more than one envelope. Open all resistor envelopes in this pack before you check them against the Parts List.				
1/2-Watt				
A1	6-101	4	100 Ω (brown-black-brown)	R211, R227, R243, R261
A1	6-511	2	510 Ω (green-brown-brown)	R201, R233
A1	6-102	4	1000 Ω (brown-black-red)	R209, R226, R241, R259
A1	6-332	4	3300 Ω (orange-orange-red)	R212, R213, R244, R245
A1	6-472	4	4700 Ω (yellow-violet-red)	R218, R248, R265, R266
A1	6-103	4	10 kΩ (brown-black-orange)	R207, R224, R239, R256
A1	6-153	8	15 kΩ (brown-green-orange)	R205, R206, R215, R217, R237, R238, R251, R253
A1	6-223	2	22 kΩ (red-red-orange)	R203, R235
A1	6-273	6	27 kΩ (red-violet-orange)	R208, R221, R228, R242, R249, R258
A1	6-513	2	51 kΩ (green-brown-orange)	R204, R236
A1	6-823	2	82 kΩ (gray-red-orange)	R223, R255
A1	6-154	4	150 kΩ (brown-green-yellow)	R214, R229, R246, R262
A1	6-105	6	1 MΩ (brown-black-green)	R202, R222, R225, R234, R254, R257
1-Watt				
K1	1-54-1	2	270 Ω (red-violet-brown)	R267, R268
CAPACITORS				
Disc				
A2	21-157	2	5 pF	C205, C224
A2	21-7	2	33 pF	C215, C234
A2	21-191	2	510 pF	C209, C228

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Capacitors (cont'd.)				
A2	21-163	2	.001 μF (1000)	C204, C223
A2	21-173	2	.0022 μF (2200)	C218, C237
A2	21-48	2	.05 μF	C216, C235
A2	21-99	2	.2 μF	C211, C229
Other Capacitors				
K3	29-3	2	.0027 μF (2700) polystyrene	C203, C222
J2	27-129	4	.047 μF Mylar	C212, C213, C231, C232
J2	27-77	2	.1 μF Mylar	C238, C239
J2	27-145	4	.22 μF Mylar	C201, C202, C219, C221
M2	25-820	6	10 μF electrolytic (nonpolar)	C206, C214, C217, C225, C233, C236
J3	25-116	4	50 μF electrolytic	C207, C208, C226, C227
TRANSISTORS				
NOTE: Transistors are marked for identification in one of the following four ways: 1. Part number. 2. Type number. 3. Part number and type number. 4. Part number with a type number other than the one listed.				
K4	417-235	4	2N4121	Q202, Q206, Q209, Q213
J4	417-283	4	SM07275	Q203, Q207, Q210, Q214
J4	417-284	6	SM62186	Q201, Q204, Q205, Q208, Q211, Q212
CONTROLS-SWITCHES				
L1	12-153	1	25k/25k dual control	R232/R26
L1	12-155	2	100k/100k dual control	R216/R252, R219/R247
L2	64-836	1	Double switch assembly	SW202
L3	64-790	1	Large switch assembly	SW201

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
HARDWARE				
L4	250-163	2	4-40 × 5/16" self-tapping screw	
L5	250-295	1	#5 × 3/8" self-tapping screw	
L6	259-6	1	#6 solder lug	
L7	252-39	3	1/4" nut	
L8	259-12	3	1/4" solder lug	

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
MISCELLANEOUS				
	344-50	30"	Black wire	
	340-8	6"	Bare wire	
J5	432-134	2	Wire connector	
L9	432-929	1	Circuit board plug	
PARTS FROM FINAL PACK				
	343-15	96"	Shielded cable	
	85-1910-3	1	Tone circuit board	

Proceed to Page 48 and assemble the tone circuit board. Do not unpack any more of your kit until you are instructed to do so.

OUTPUT AMPLIFIER CIRCUIT BOARD

When you are directed to this section in a specific step, refer to the "Pack Index Sheet" inside the carton marked Packs 1-6 and unpack the parts from Pack #6. Then check these parts against the following list.

NOTE: This section of the Parts List lists the parts for two identical circuit boards. Therefore, the "QTY." column lists the total number of parts you should have for both circuit boards. The "Circuit Component Number" column lists the component numbers for only one of the circuit boards—since both boards are identical.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTORS				
The resistors may be packed in more than one envelope. Open all the resistor envelopes in this pack before you check them against the Parts List.				
1/2-Watt, 5%				
A1	6-100	4	10 Ω (brown-black-black)	R733, R735
A1	6-150	6	15 Ω (brown-green-black)	R707, R726, R727
A1	6-220	2	22 Ω (red-red-black)	R716
A1	6-390	2	39 Ω (orange-white-black)	R724
A1	6-680	6	68 Ω (blue-gray-black)	R708, R725, R728
A1	6-750	4	75 Ω (violet-green-black)	R723, R729
A1	6-101	4	100 Ω (brown-black-brown)	R715, R722

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Resistors (cont'd.)				
A1	6-151	2	150 Ω (brown-green-brown)	R717
A1	6-681	2	680 Ω (blue-gray-brown)	R704
A1	6-821	2	820 Ω (gray-red-brown)	R714
A1	6-102	10	1000 Ω (brown-black red)	R701, R709, R710, R718, R721
A1	6-222	2	2200 Ω (red-red-red)	R713
A1	6-272	4	2700 Ω (red-violet-red)	R705, R706
A1	6-472	2	4700 Ω (yellow-violet-red)	R719
A1	6-682	2	6800 Ω (blue-gray-red)	R703
A1	6-153	2	15 kΩ (brown-green-orange)	R711
A1	6-333	2	33 kΩ (orange-orange-orange)	R702

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Other Resistors				
K1	1-26-1	2	15 kΩ, 1-watt, 10% (brown-green-orange)	R712
N1	1-21-2	2	20 Ω, 2-watt, 5% (red-black-black)	R734
M1	3-11-5	4	.33 Ω, 5-watt	R731, R732
CAPACITORS				
Disc				
A2	21-3	2	10 pF	C704
A2	21-75	6	100 pF (100k)	C700, C713, C718
A2	21-16	8	.01 μF	C709, C712, C714, C717
A2	21-82	2	.02 μF	C711
A2	21-48	8	.05 μF	C705, C706, C707, C708
A2	21-195	6	.1 μF	C719, C721, C723
Electrolytic				
J3	25-820	2	10 μF (nonpolar)	C701
H2	25-267	4	100 μF	C702, C722
M2	25-249	2	250 μF (nonpolar)	C703
H2	25-262	4	250 μF 15V	C715, C716
DIODES				
A3	56-59	2	1N750A, 4.7V zener	ZD701
A3	56-73	10	MZ2360	D703, D704, D705, D706, D707
A3	56-74	2	MZ2362	D702
A3	57-65	4	1N4002	D708, D709
TRANSISTORS				

NOTE: Transistors are marked for identification in one of the following four ways:

1. Part number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one listed.

M3	417-221	8	TZ582	Q701, Q702, Q703, Q708
M4	417-254	4	MJ802	Q710, Q712
J4	417-801	2	MPSA20	Q707
J4	417-811	2	MPSL01	Q704

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Transistors (cont'd).				
M5	417-868	2	RCA29C	Q709
M5	417-869	2	RCA30C	Q711
M6	417-870	4	RCA1A16	Q705, Q706
INSULATORS				
M7	75-159	4	Small transistor insulator	
M8	75-60	4	Large transistor insulator	
CONNECTORS-SOCKETS				
M9	432-157	2	Plug connector shell	
M10	432-861	8	Connector pin	
M11	434-186	2	Phono socket	
M12	434-250	4	Transistor socket	
HARDWARE				
M13	250-273	4	4-40 × 3/8" screw	
D9	252-2	4	4-40 nut	
D10	254-9	4	#4 lockwasher	
M14	250-89	10	6-32 × 3/8" screw	
M15	250-26	8	6-32 × 5/8" screw	
E11	254-1	8	#6 lockwasher	
M16	255-142	8	Tapped spacer	
WIRE				
	344-15	18"	Black wire	
	344-16	24"	Red wire	
	344-79	18"	Brown wire	
	344-82	24"	White wire	
MISCELLANEOUS				
M17	40-958	2	3 μH	L701
M18	354-6	2	Cable tie	
M19	205-1442	4	Mounting plate	
M20	215-607	4	Small heat sink	
	352-13	2	Silicone grease	
PARTS FROM FINAL PACK				
M21	215-96	2	Large heat sink	
	85-1739-3	2	Output amplifier circuit board	

Proceed to Page 56 and assemble the output amplifier circuit boards. Do not unpack any more of your kit until you are instructed to do so.

FINAL PACK

When you are directed to this section in a specific step, unpack the remaining parts of your kit and check them against the following list.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
RESISTOR-CONTROL				
N1	1-20-2	1	100 Ω, 2-watt (brown-black-brown)	Test Resistor
N2	13-17	1	100 kΩ/25 kΩ control	R4
INSULATORS				
N3	73-46	10	Plastic grommet	
CABLES				
N4	134-202	2	Phono cable	
	134-941	1	15-connector plug with wires	
	134-943	1	Wire harness	
PANELS				
N5	203-1738	1	Front panel	
N6	203-1765	1	Door panel	
BRACKETS				
P1	204-135	1	Small angle bracket	
P2	204-2111	2	Door mounting bracket	
P3	204-2226	1	Control mounting bracket	
P4	204-2133	1	2-jack bracket	
P5	204-2243	1	1-jack bracket	
PLATES-SHIELDS				
P6	205-1614	1	Bottom plate	
P7	205-1623-2	1	Top plate	
P8	206-1211	1	Transformer shield	
P9	206-1212-1	1	Preamplifier shield	
KNOBS-PLUGS				
Q1	462-961	3	Small knob with pointer	
Q2	462-1013	9	Small knob without pointer	
Q3	462-940	3	Large knob	
Q4	432-871	4	Speaker plug	
Q5	438-4	4	Phono plug	
HARDWARE				

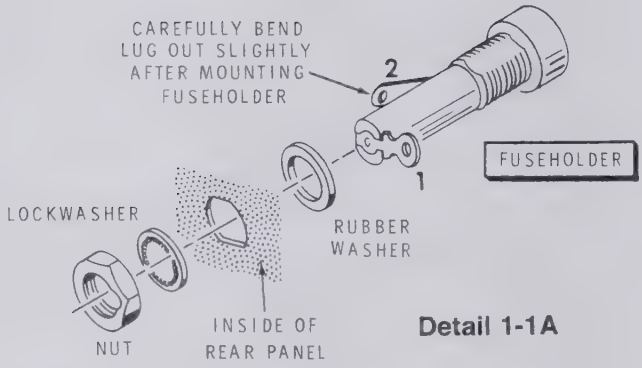
Hardware packets are marked to show the size of the hardware they contain (HDW #4, or HDW #2 and #6, etc.). You may have to open more than one packet--in this pack--to locate all the hardware of any one size (#6, for example).

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
#4 Hardware				
R1	250-489	2	#4 × 3/16" self-tapping screw	
#6 Hardware				
E1	250-56	15	6-32 × 1/4" screw	
E2	250-276	10	6-32 × 3/8" black flat head screw	
E3	250-381	22	6-32 × 3/8" black screw	
R2	250-1101	2	6-32 × 3/8" T bolt	
E4	250-1227	16	#6 × 3/8" black sheet metal screw	
R3	250-151	6	#6 × 1/2" wood screw	
R4	250-503	2	6-32 × 3/4" flat head screw	
R5	250-569	8	6-32 × 3/4" black screw	
R6	250-1173	2	6-32 × 7/8" screw	
E7	252-3	35	6-32 nut	
R7	252-22	4	#6 thin push-on nut	
R8	252-84	3	#6 thick push-on nut	
E10	253-60	2	#6 flat washer	
E11	254-1	36	#6 lockwasher	
E12	259-1	2	#6 solder lug	
Other Hardware				
F3	259-24	3	#8 long solder lug	
R9	252-7	4	Control nut	
R10	254-5	3	Thin control lockwasher	
R11	254-4	1	Large control lockwasher	
R12	253-10	1	Control flat washer	
R13	255-103	1	3/8" spacer	
R14	255-15	2	1/2" spacer	
MISCELLANEOUS				
	305-56	1	Set of wood end panels	
S1	203-1753	1	Bezel	
S2	206-1165	4	Transistor cover	
S3	206-1210	1	Display base	
S4	258-706	2	Door spring	
S5	261-28	4	Plastic foot	
S6	266-913	2	Hinge pivot	
M18	354-6	2	Cable tie	
G9	407-736	1	Meter	
S7	412-82	10	Lamp	
S8	422-1	2	Fuse block	
F7	421-37	2	1-ampere fuse	
S9	431-49	1	Terminal strip	
S10	436-44	3	Phone jack	
S11	446-658	1	Window	
S12	453-266	2	Shaft extension	
S13	455-50	3	Knob bushing	
F10	455-54	3	Nylon bearing	
S14	456-16	2	Shaft coupler	
S15	391-94	1	Heathkit nameplate	

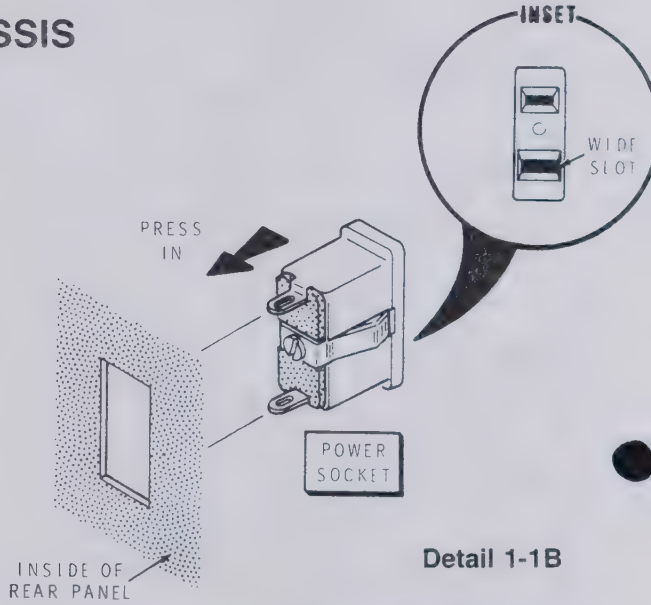
Proceed to Page 65 and complete the assembly of your kit

STEP-BY-STEP ASSEMBLY

CHASSIS



Detail 1-1A



Detail 1-1B

Refer to Pictorial 1-1 (in the "Illustration Booklet") for the following steps.

( ) Position the rear panel (printed side down) on a soft cloth on your work surface as shown.

( ) Refer to Detail 1-1A and mount the fuseholder at B with the hardware supplied with the fuseholder. Be sure to position the lugs as shown and do not overtighten the nut.

( ) Carefully bend lug 2 of fuseholder B away from the fuseholder body as shown.

( ) F1: Remove the fuseholder cap by twisting it counterclockwise with a screwdriver. Then install a 3-ampere, slow-blow fuse and carefully replace the cap. (NOTE: Later you will wire your kit to operate from 120 or 240 volts AC. If you intend to wire it for 240 volts AC, install the 2-ampere fuse.)

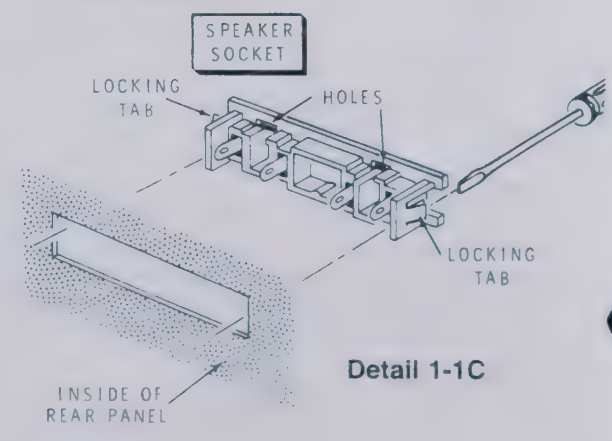
NOTE: When you install the power sockets in the following steps, be sure to position the sockets with the wide slot down as shown in the inset drawing on Detail 1-1B.

( ) Refer to Detail 1-1B and press a power socket into the chassis at C.

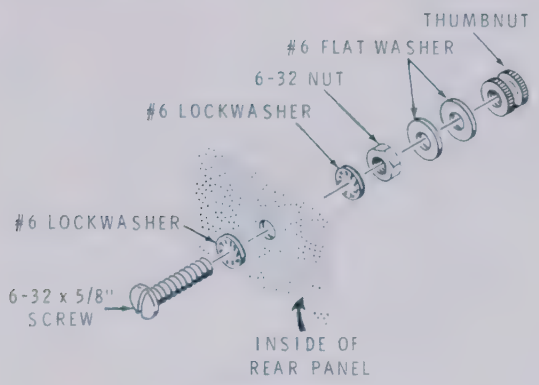
( ) In the same manner, press the other power socket into the chassis at D.

( ) Refer to Detail 1-1C and press a speaker socket into the chassis at E. Be sure the two indicated holes are positioned up. Then snap the two locking tabs into position with a screwdriver if they do not snap into place by themselves.

( ) In a similar manner, press another speaker socket into the chassis at I.



Detail 1-1C



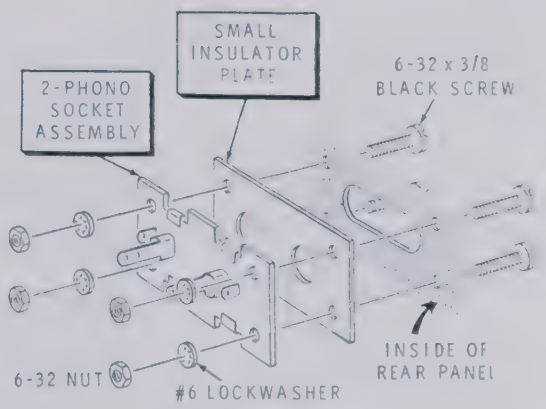
Detail 1-1D

NOTE: Use the plastic nut starter supplied with this kit to hold and start 6-32 and 4-40 nuts on screws.

( ) Refer to Detail 1-1D and install a 6-32 x 5/8" screw at F as shown. Use two #6 lockwashers, a 6-32 nut, two #6 flat washers, and a 6-32 thumbnut.

( ) Refer to Detail 1-1E and install a 2-phono socket assembly and small insulator plate at G. Use four 6-32 x 3/8" black screws, four #6 lockwashers, and four 6-32 nuts.

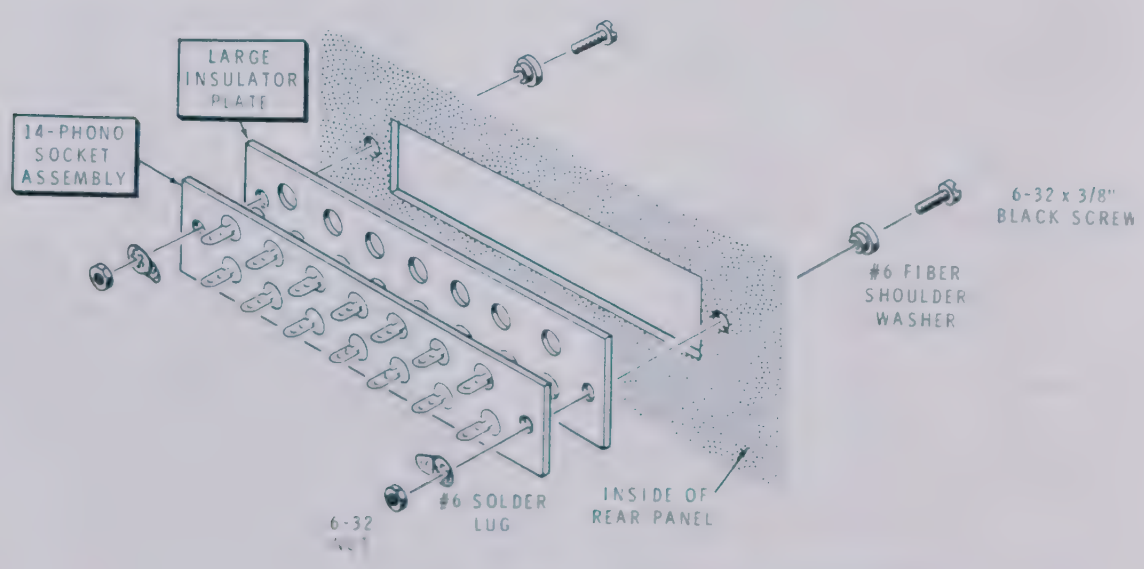
( ) In the same manner, install another 2-phono socket assembly and small insulator plate at H.



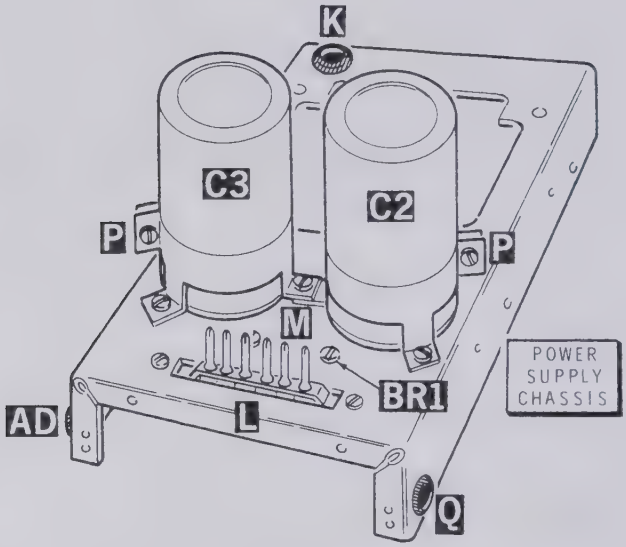
Detail 1-1E

( ) Refer to Detail 1-1F and install a 14-phono socket assembly and large insulator plate at J. Use two 6-32 x 3/8" black screws, two #6 fiber shoulder washers, two #6 solder lugs, and two 6-32 nuts. Be sure the fiber shoulder washers are seated properly in their holes and the solder lugs are positioned as shown.

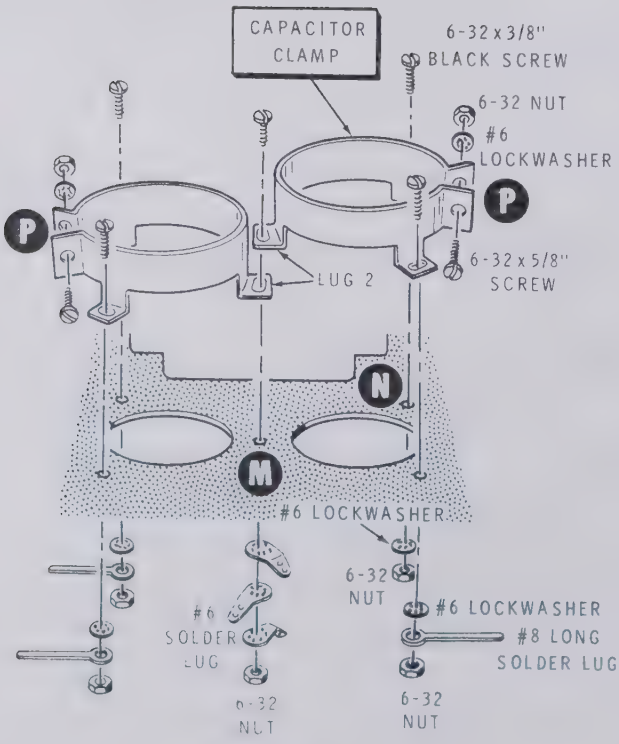
( ) Set the rear panel aside temporarily.



Detail 1-1F



PICTORIAL 1-2



Detail 1-2A

Refer to Pictorial 1-2 for the following steps.

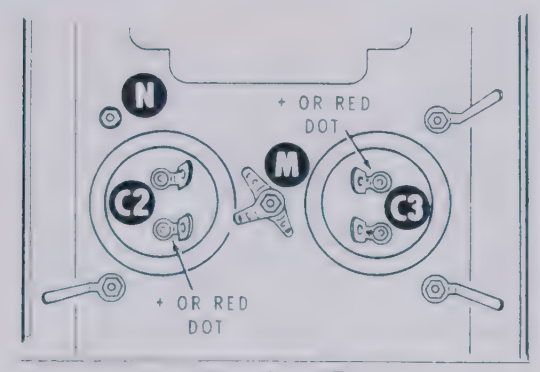
( ) Position the power supply chassis as shown in the Pictorial.

( ) Refer to Detail 1-2A, place a 6-32 x 3/8" black screw through lug 2 of a capacitor clamp, through lug 2 of another capacitor clamp, and through hole M. Loosely secure the screw with three #6 solder lugs and a 6-32 nut.

( ) Loosely install a 6-32 x 3/8" black screw, a #6 lockwasher, and 6-32 nut at N.

( ) Loosely install a 6-32 x 3/8" black screw, #6 lockwasher, #8 long solder lug, and 6-32 nut at each of the remaining three mounting holes. NOTE: Bend the solder lugs and position them as shown in Detail 1-2B.

( ) Loosely install a 6-32 x 5/8" screw, #6 lockwasher and a 6-32 nut at P in each capacitor clamp.

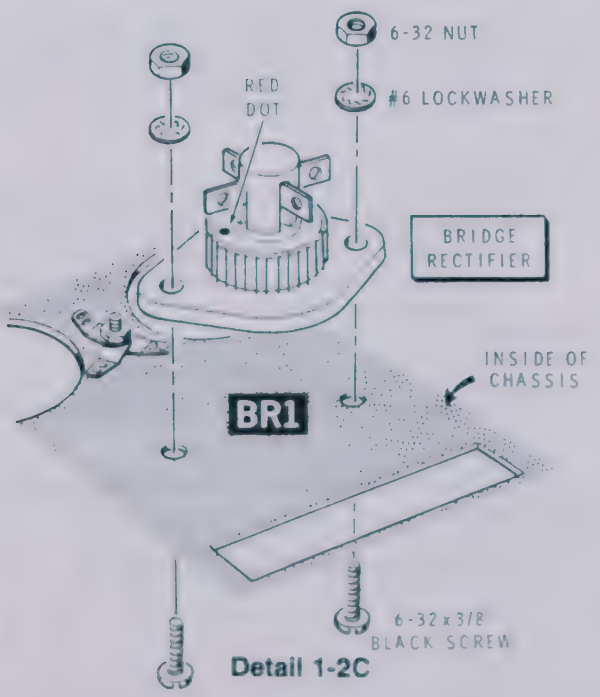


Detail 1-2B

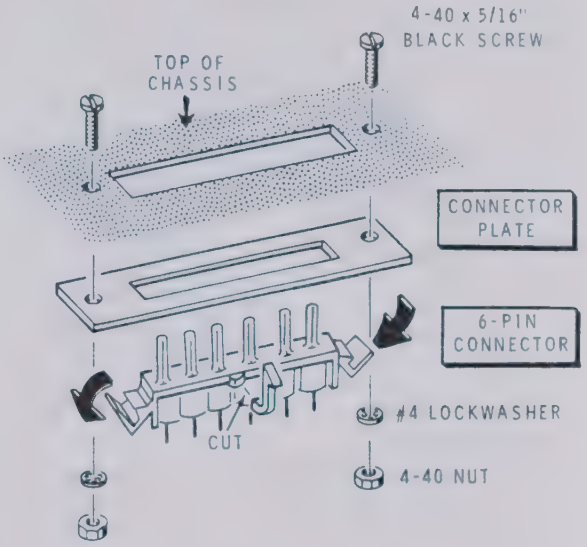
( ) Refer to Detail 1-2B, turn the power supply chassis over, position the three solder lugs at M as shown, and tighten the screw.

( ) C3: Again refer to Detail 1-2B and install a 10,000 μF electrolytic capacitor at C3. Be sure the positive (+ or red dot) marked lug is positioned as shown. Then tighten screw P of the capacitor clamp. NOTE: The capacitor lugs may be positioned differently than those shown.

( ) C2: In a similar manner, install the other 10,000 μF electrolytic capacitor at C2. Be sure its positive (+ or red dot) marked lug is positioned as shown. Then tighten screw P of the capacitor clamp.



Detail 1-2C



Detail 1-2D

( ) Tighten the remaining four mounting screws.

( ) If necessary, bend the capacitor lugs so they are up as shown.

( ) BR1: Refer to Detail 1-2C and position the 10A20 bridge rectifier (#57-67) with its red dot as shown. Then mount the rectifier at BR1 on the inside of the power supply chassis with two 6-32 × 3/8" black screws, two #6 lockwashers, and two 6-32 nuts. (Your rectifier may look different than the one shown.)

( ) Turn the power supply chassis right side up again.

( ) Refer to Detail 1-2D and mount the connector plate at L with two 4-40 x 5/16" black screws, two #4 lockwashers, and two 4-40 nuts.

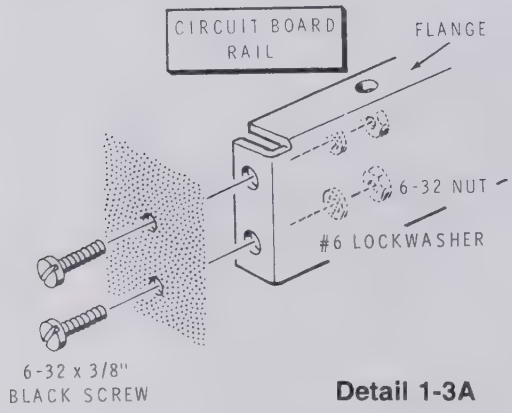
( ) Cut the nylon catch off the 6-pin connector.

( ) Bend the tabs back and install the connector in the connector plate as shown.

( ) Install a rubber grommet at K.

( ) Install rubber grommets at Q and AD.

( ) Set the power supply chassis aside temporarily.



Detail 1-3A

Refer to Pictorial 1-3 (in the "Illustration Booklet") for the following steps.

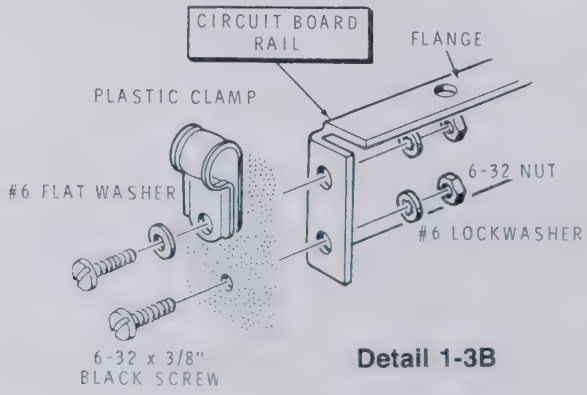
( ) Mount the left side panel to the rear panel. Use three 6-32 x 3/8" black screws, three #6 lockwashers, and three 6-32 nuts.

( ) Mount the power supply chassis to the rear panel as shown. Use four #6 x 3/8" black sheet metal screws.

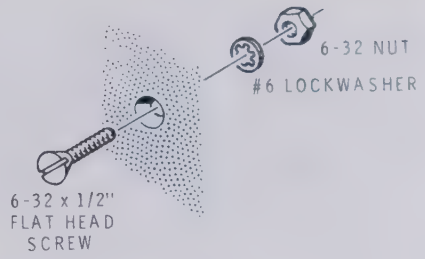
( ) Mount the right side panel to the rear panel. Use three 6-32 x 3/8" black screws, three #6 lockwashers, and three 6-32 nuts.

( ) Mount the front subpanel to the right and left side panels. Use four 6-32 × 3/8" black flat head screws, four #6 lockwashers, and four 6-32 nuts as shown.

( ) Refer to Detail 1-3A and mount a circuit board rail to the front subpanel at AC and the rear panel as shown. Use four #6 × 3/8" black screws, four #6 lockwashers, and four 6-32 nuts. Be sure the rail flange is positioned up as shown.



Detail 1-3B



Detail 1-3C

( ) Refer to Detail 1-3B and, in a similar manner, mount another circuit board rail at AB. Be sure the flange is positioned up as shown and use a #6 flat washer and plastic clamp as shown.

( ) Secure the front subpanel to the power supply chassis. Use four #6 × 3/8" black sheet metal screws.

( ) Refer to Detail 1-3C and install a 6-32 × 1/2" flat head screw, #6 lockwasher, and 6-32 nut at AE in the front subpanel.

( ) As before, install a 6-32 × 1/2" flat head screw, #6 lockwasher, and 6-32 nut at AF.

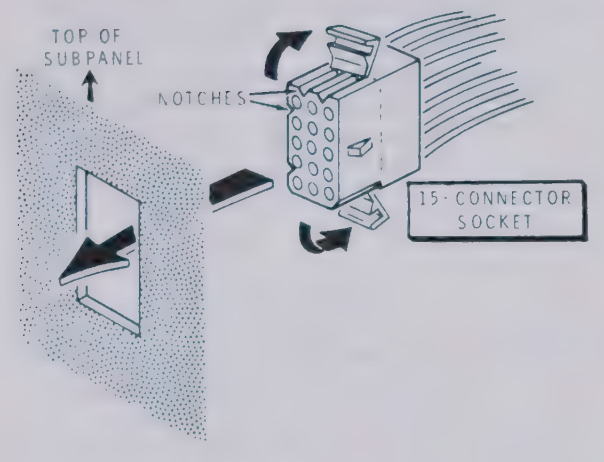
( ) Refer to Detail 1-3D (in the "Illustration Booklet") and cut the 6" × 8" insulating dimensions shown. Mark the large pieces A, B, C, and D as shown and discard the pieces that are shown shaded.

( ) Remove the protective backing from the piece of prepared insulating paper marked A; then press the insulating paper in place between holes R and S on the front subpanel as show. Be sure the insulating paper does not cover hole T, but does cover the two screw heads.

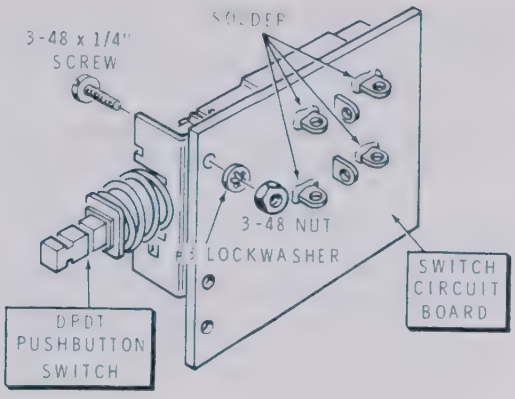
( ) Install circuit board standoffs at R and S. See inset drawing #1. Be sure the snap tab is up as shown.

( ) Install nylon bearings at U and V. See inset drawing #2.

( ) Install rubber grommets at W, X, and AD.



Detail 1-3E



Detail 1-3F

( ) Refer to Detail 1-3E, bend back the tabs, and install the 15-connector socket with wires at Z. Be sure the socket notches are positioned as shown.

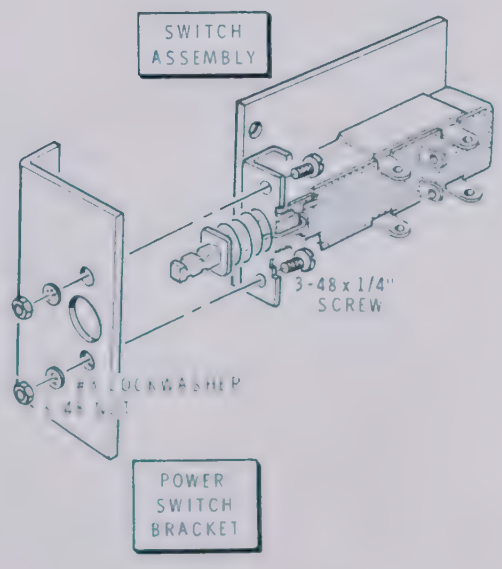
( ) Remove any tape that may be holding the wires together.

( ) Route the brown, orange, yellow and green wires coming from the 15-connector socket through hole AA. These wires will be connected later.

( ) Refer to Detail 1-3F and secure the DPDT pushbutton switch to the switch circuit board with a 3-48 × 1/4" screw, #3 lockwasher, and 3-48 nut. Then solder the indicated four switch lugs to the circuit board.

( ) SW1: Refer to Detail 1-3G and mount the switch assembly to the power switch bracket with two 3-48 × 1/4" screws, two #3 lockwashers, and two 3-48 nuts as shown.

( ) Mount the power switch bracket to the left side panel at SW1 with two black 6-32 × 3/8" flat head screws, two #6 lockwashers, and two 6-32 nuts.



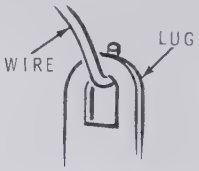
Detail 1-3G

Refer to Pictorial 1-4 (in the "Illustration Booklet") for the following steps.

( ) *Turn the chassis upside down as shown.

( ) Cut two 2" lengths of large bare wire.

NOTE: In the following steps, some solder connections will require much more heat than others.

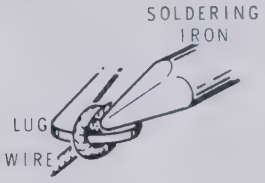


Detail 1-4A

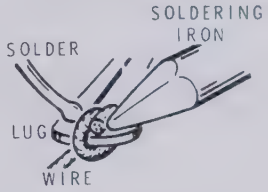
( ) Route one end of a 2" bare wire through rectifier BR1 lug 1. Then refer to Detail 1-4A and connect the other end to capacitor C2 lug 2 as shown.

( ) Refer to the following information and solder the wire to the capacitor lug as shown. NOTE: The lug that is shown in the illustration may look different than the one in your kit. However, the soldering procedure is the same. Always keep your soldering iron tip clean.

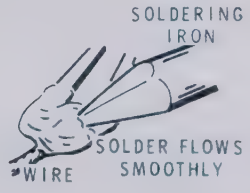
1. Push the soldering iron tip against the wire *and* the lug. Heat both the wire and the lug for two to three seconds.



2. Apply solder to the wire and the lug, *not* to the soldering iron. IMPORTANT: Let the heat of the wire and lug melt the solder.



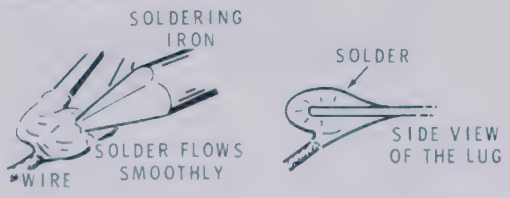
3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



( ) Check the soldered connection. Compare it to the illustrations below.

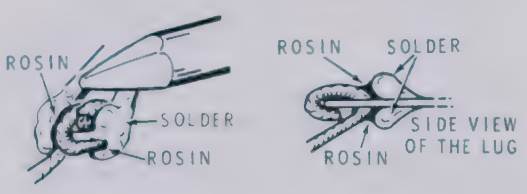
A GOOD SOLDER CONNECTION

A good connection flows evenly and blends with the lug and the wire.



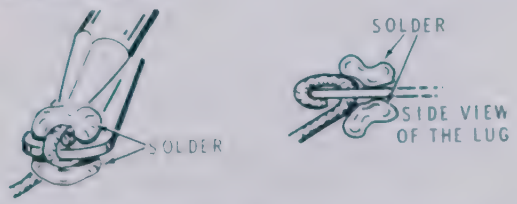
POOR SOLDER CONNECTIONS

When solder does not flow onto the wire, it causes a poor connection. A dark rosin bead surrounds and insulates the lead from the lug.



The above illustration shows a "rosin connection." With this type of connection, your kit will not operate correctly or it may not operate at all. To correct this type of connection, reheat the connection and allow time for the solder to flow around the wire. You may need to add some new solder to the connection to get it to flow properly.

Here, the solder appears to sit on top of the lug and wire and does not flow.



The above illustration shows a "cold solder connection". In this case, the solder was applied to the soldering iron instead of the lug and wire, or only the lug or only the wire was heated. Both the lug *and* the wire must be heated together. To correct this type of connection, reheat the connection and add some new solder.

( ) Solder the connection at rectifier BR1 lug 1.

NOTE: In the following steps, (NS) means not to solder because other wires will be added later. "S-" with a number, such as (S-3), means to solder the connection. The number following the "S" tells how many wires are at the connection.

( ) Connect the other 2" length of bare wire from capacitor C3 lug 2 (S-1) to rectifier BR1 lug 3 (S-1).

( ) Cut a 3" length of large bare wire.

( ) Connect the bare wire to solder lugs 1 and 2 at M as shown, and solder the connections. Form the wire in a 3/4" diameter circle.

( ) Cut a 5-3/4" length of large bare wire.

NOTE: Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2), one entering and one leaving the connection. Be especially careful when you solder these connections to apply enough solder and heat to solder these "through wires."

( ) Connect the bare wire from C3 lug 1 (S-1) through both holes of the remaining solder lug at M (S-2, bend the solder lug as necessary). Then form a 3/4" diameter loop (solder the wire at the two points of the solder lug), to C2 lug 1 (S-1).

NOTE: When you prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. Then if the wire is stranded, twist the wire strands together and melt a small amount of solder on them to hold the strands together.

Prepare the following wires:

Length	Wire
7-1/2"	Medium red stranded
10-1/2"	Medium red stranded
10-1/2"	Medium white stranded
6"	Medium white stranded
10"	Medium black stranded
8-1/2"	Medium black stranded
16"	Medium brown stranded
13-1/2"	Large blue stranded

Connect the prepared stranded wires as follows. Route the wires as shown — the free end will be connected later.

( ) 7-1/2" red to the bare wire connected to capacitor C2 lug 2 (NS). Connect it near the lug as shown and route the free end through grommet Q

( ) 10-1/2" red to the bare wire connected to capacitor C2 lug 2 (S-2) as shown. Route the free end through grommet AD.

( ) 10-1/2" white to the bare wire connected to capacitor C3 lug 2 (NS) as shown. Route the free end through grommet Q.

( ) 6" white to the bare wire connected to capacitor C3 lug 2 (S-2) as shown. Route the free end through grommet AD.

NOTE: When you connect wires to the rings at M, you **must** connect the wires down on the rings as close as possible to the solder lugs. This will ensure minimum hum and noise from your amplifier.

( ) 10" black to the indicated wire ring at M (NS). Route the free end through grommet Q.

( ) 8-1/2" black to the indicated wire ring at M (S-2). Route the free end through grommet AD.

( ) 16" brown. Route it through grommets Q and X as shown.

( ) 13-1/2" blue. Route it through grommets X and AD as shown.

( ) Refer to Part A of Detail 1-4B and crimp and solder a female pin connector on the free end of each wire coming from grommet Q.

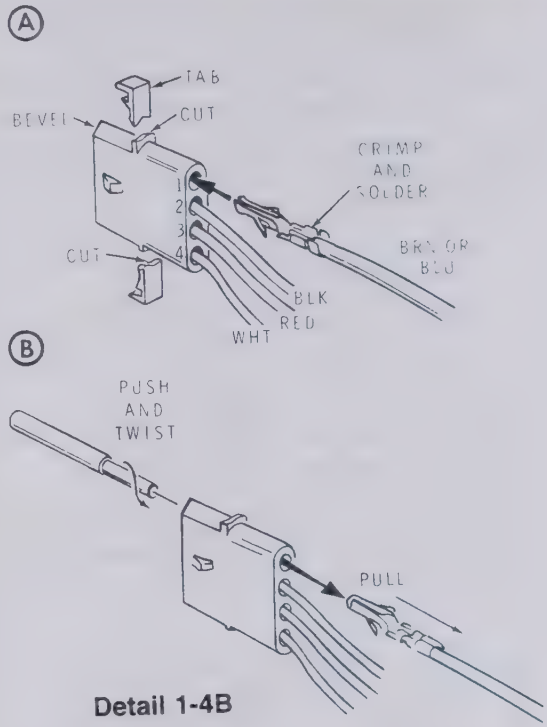
( ) Position a 4-pin shell with the tabs and beveled edge as shown. Then perform the following steps and push the connectors into the shell until they latch in place. (NOTE: If you get the wrong connector in a hole, use the pin extractor to remove the connector as shown in Part B of the Detail.)

( ) Brown in hole. 1.
( ) Black in hole 2.
( ) Red in hole 3.
( ) White in hole 4.

( ) Cut off the two shell tabs.

( ) As before, install female pin connectors on the four wires coming from grommet AD.

( ) As before, refer to Detail 1-4B, install the connectors in another 4-pin shell, and cut off the two tabs. Install the blue wire in hole 1.



Detail 1-4B

Refer to Pictorial 1-5 (in the "Illustration Booklet") for the following steps.

( ) Prepare the following wires:

Length	Wire
13"	Medium black stranded
13"	Medium black stranded
20"	Medium black stranded
20"	Large gray stranded
20"	Large yellow stranded
20"	Medium white stranded

Connect the prepared stranded wires as follows:

( ) 13" black to the indicated bare wire ring at M (NS). Route the free end through grommet K.

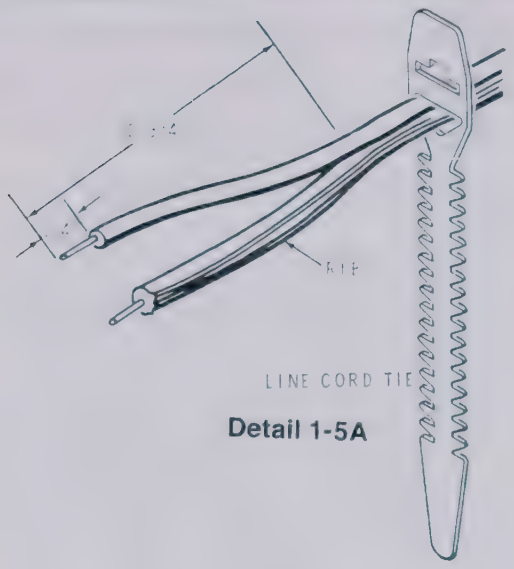
( ) 13" black to the indicated bare wire ring at M (S-2). Route the free end through grommet K.

( ) 20" black. Route this wire through grommets X and K as shown.

( ) 20" gray. Route this wire through grommets X and K as shown.

( ) 20" yellow. Route this wire through grommets X and K as shown.

( ) 20" white. Route this wire through grommets X and K as shown.



Detail 1-5A

( ) Refer to Detail 1-5A and prepare the line cord end as shown. Twist the bare ends and apply solder to them.

( ) Refer again to Detail 1-5A and place a line cord tie over the line cord as shown.

NOTE: One lead of the line cord has ribs molded in its insulation. Position this lead as directed in the following step.

( ) Install the line cord at A in the rear panel. Position the ribbed lead as shown in the Pictorial.

NOTE: In some of the following steps, you will be directed to "make a mechanically secure connection." Do this by inserting the wire through and/or wrapping it around the lug before you solder it.

( ) Connect the ribbed line cord lead to socket C lug 1 (NS) and the smooth lead to socket C lug 2 (NS). Make mechanically secure connections.

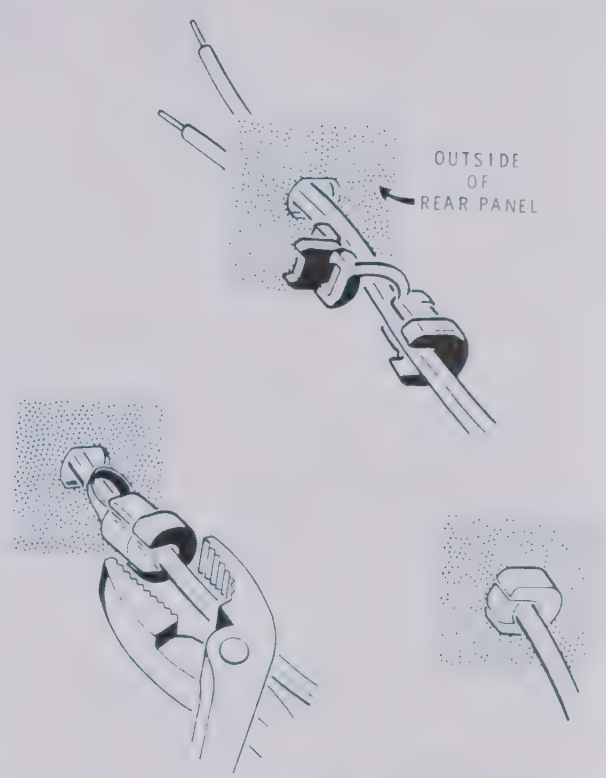
( ) Refer to Detail 1-5B and install the strain relief at A.

( ) Prepare the following wires:

Length	Wire
20"	Large orange stranded
20"	Large red stranded
20"	Large orange stranded
2-1/4"	Large red stranded
20"	Large red stranded

Connect the prepared stranded wires as follows:

( ) 20" orange to power socket C lug 1 (S-2). Make a mechanically secure connection. Route the free end through grommets AD and W.



Detail 1-5B

( ) 20" red to power socket C lug 2 (S-2). Make a mechanically secure connection. Route the free end through grommets AD and W.

( ) 20" orange to power socket D lug 1 (NS). Make a mechanically secure connection. Route the free end through grommets AD and W.

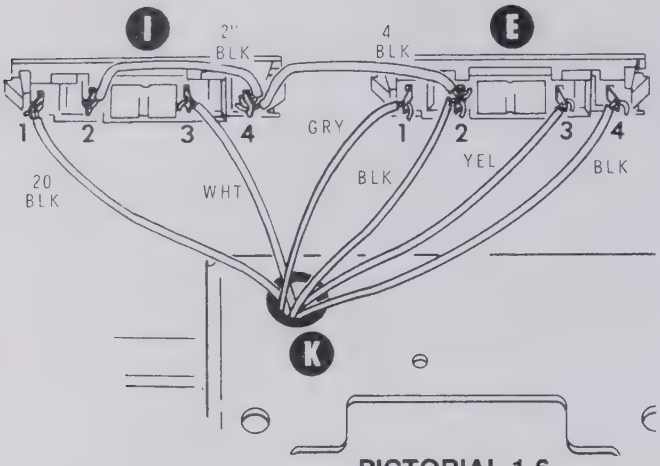
( ) 2-1/4" red from fuseholder B lug 1 (S-1) to power socket D lug 2 (NS). Make mechanically secure connections.

( ) 20" red to power socket D lug 2 (NS). Make a mechanically secure connection. Route the free end through grommets AD and W.

( ) Cut both leads of the .01 μF disc capacitor to 1/2".

( ) Cut two 1/4" lengths of teflon sleeving and slide one onto each capacitor lead.

( ) C1: Connect the capacitor between power socket D lugs 1 (NS) and 2 (S-3). Make mechanically secure connections.



PICTORIAL 1-6

Refer to Pictorial 1-6 for the following steps.

Turn the chassis right side up and connect wires coming from grommet K to speaker socket I as follows:

( ) 20" black to lug 1 (S-1). Be sure this is the long black wire you routed through grommets K and X as shown on Pictorial 1-5.

( ) White to lug 3 (S-1).

Connect wires coming from grommet K to speaker socket E as follows:

( ) Gray to lug 1 (S-1).

( ) Either black to lug 2 (NS).

( ) Yellow to lug 3 (S-1).

( ) Other black to lug 4 (S-1).

( ) Prepare the following wires:

LENGTH	WIRE
4"	Medium black stranded
2"	Medium black stranded

Connect the prepared stranded wires as follows:

( ) 4" black from socket E lug 2 (S-2) to socket I lug 4 (NS).

( ) 2" black to socket I between lugs 4 (S-2) and 2 (S-1).

Refer to Pictorial 1-7 (in the "Illustration Booklet") for the following steps.

( ) Refer to Detail 1-7A and cut and prepare the power transformer leads as shown. Measure the leads from where they come out of the transformer. Apply solder to the bare ends if necessary.

( ) Mount the power transformer at T1. Be sure the leads are positioned as shown. Use a #10 solder lug and an 8-32 nut at BA. Use #8 lockwashers and 8-32 nuts at the other three locations (NOTE: The #10 solder lug will not be used unless the electrical codes in your area require that you install and use a 3-wire line cord in your amplifier. In this case, you will connect and solder the green wire of the line cord to the solder lug.)

( ) Wrap the long solder lugs at GB and GC around the nearby wires to hold them in place.

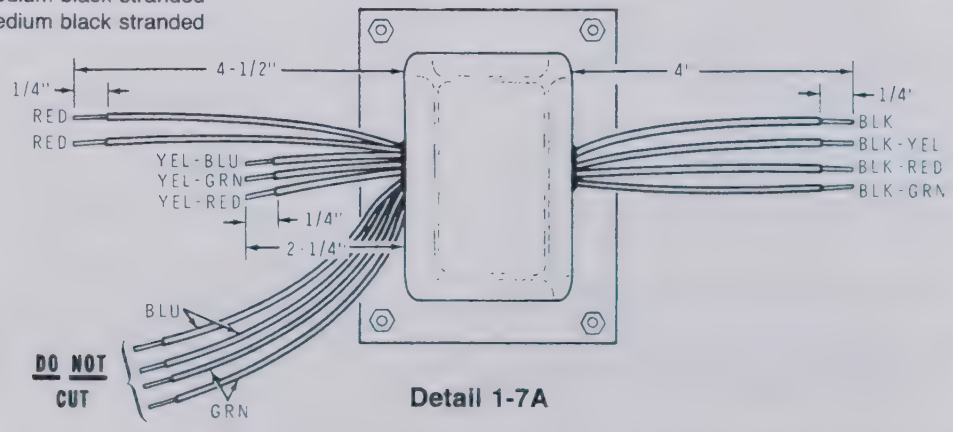
ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given, one for 120 VAC line voltage and the other for 240 VAC line voltage. In the U.S.A., 120 VAC is most often used, while in other countries 240 VAC is more common. USE ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

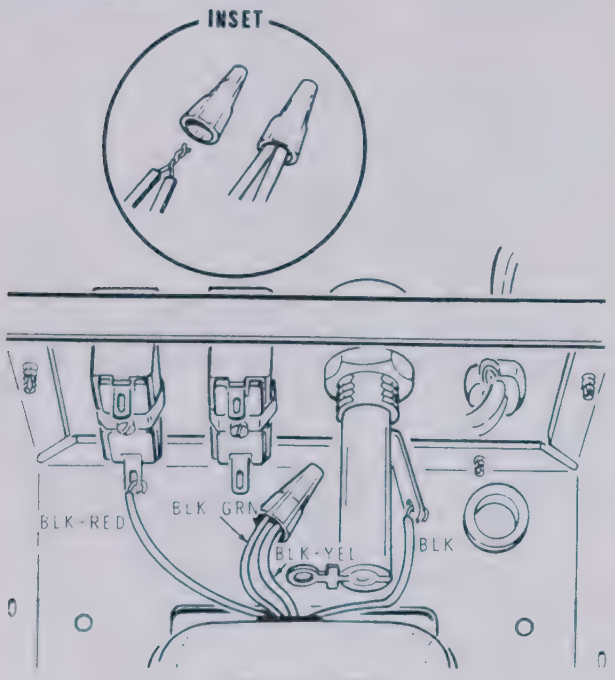
120 VAC Wiring:

( ) Refer to Pictorial 1-7 and connect the black-yellow and the black-red transformer leads to power socket D lug 1 (S-4). Make mechanically secure connections.

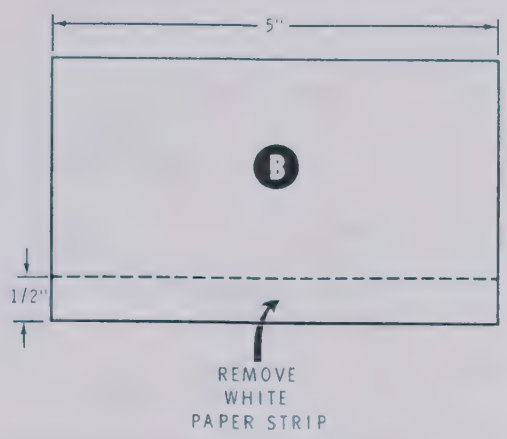
( ) Connect the black and the black-green transformer leads to fuseholder B lug 2 (S-2). Make mechanically secure connections.



Detail 1-7A



Detail 1-7B



Detail 1-7C

240 VAC Wiring:

( ) Refer to Detail 1-7B and connect the black-red transformer lead to power socket D lug 1 (S-3). Make a mechanically secure connection.

( ) Connect the black transformer lead to fuseholder B lug 2 (S-1). Make a mechanically secure connection.

( ) Twist together the ends of the black-green and black-yellow transformer leads in a clockwise direction. Then twist the wire nut onto the wires in a clockwise direction. See inset drawing.

GENERAL WIRING:

Connect the remaining power transformer leads as follows Route the longer leads under the bare wires as shown.

( ) Yellow-green, yellow-red, and yellow-blue to the bottom of the indicated ring at M (S-3).

( ) Either blue to plug L lug 6 (S-1).

( ) Other blue to plug L lug 5 (S-1).

( ) Either green to plug L lug 2 (S-1)

( ) Other green to plug L lug 1 (S-1).

( ) Either red to bridge BR1 lug 4 (S-1)

( ) Other red to bridge BR1 lug 2 (S-1).

( ) Prepare the following wires:

Length	Wire
4"	Medium black stranded
13"	Black solid
11"	Brown solid

Connect the prepared wires as follows:

( ) 4" medium black stranded to the indicated bare wire loop at M (S-1). Then remove an additional 1/2" of insulation from the free wire end, connect it to plug L lugs 3 and 4, and solder the connections.

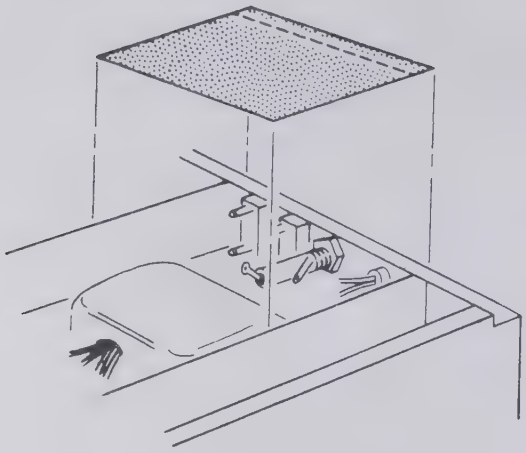
( ) 13" black solid to indicated bare wire loop at M (S-1). Route the other end through grommet Q and hole AA.

( ) 11" brown solid to plug L lug 1 (S-1). NOTE: Another wire was previously connected here. Route the other end through grommet Q and hole AA.

( ) Wrap the long solder lug at GA around the nearby wires to hold them neatly in place.

( ) Check the connections to the parts on the rear panel and remove any solder splashes, etc.

( ) Refer to Detail 1-7C and cut and remove a 1/2" x 5" strip of white protective paper from the piece of insulating paper marked B.



Detail 1-7D

( ) Apply the insulating paper to the bottom edge of the rear panel as shown in Detail 1-7D.

Refer to Pictorial 1-8 for the following steps:

( ) Position the chassis on its left side panel.

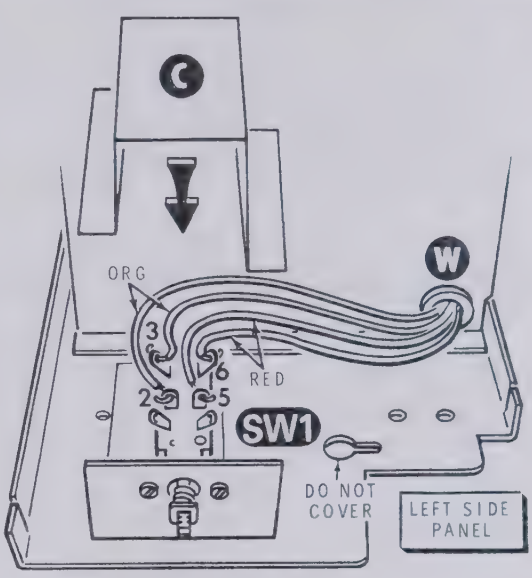
Connect the wires coming from grommet W to switch SW1 as follows. Be sure to make mechanically secure connections.

( ) Either orange to lug 3 (S-1).

( ) Other orange to lug 2 (S-1).

( ) Either red to lug 6 (S-1)

( ) Other red to lug 5 (S-1).



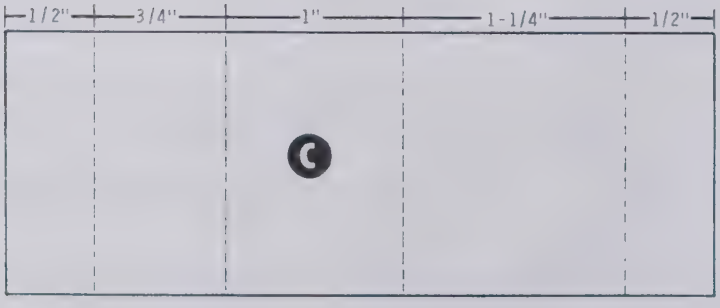
PICTORIAL 1-8

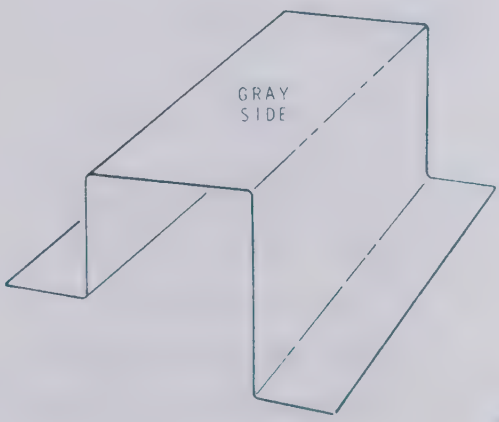
Refer to Detail 1-8A, fold the piece of insulating paper marked C.

( ) Be sure the switch circuit board and side panel are clean and free from oily residues. Then remove the protective backing from the insulating paper and press the paper into place over switch SW1 as shown. Do not cover the indicated hole in the side panel.

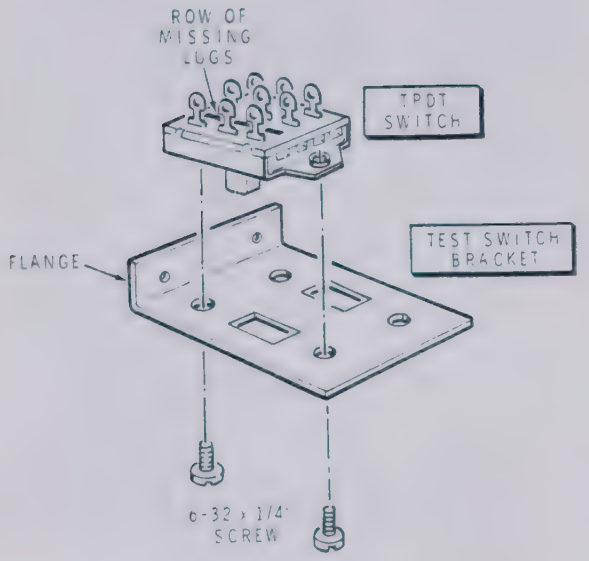
( ) Be sure switch SW1 is in the out (off) position.

( ) Set the chassis aside temporarily.





Detail 1-8A



Detail 1-9A

Refer to Pictorial 1-9 (in the "Illustration Booklet") for the following steps:

( ) Position the test switch bracket on your work surface with its flange up as shown.

( ) SW2: Refer to Detail 1-9A and loosely mount the TPDT slide switch with the row of missing lugs as shown. Use two 6-32 × 1/4" screws.

( ) SW3: Loosely mount the DPDT slide switch with two 6-32 x 1/4" screws. Then tighten the four screws.

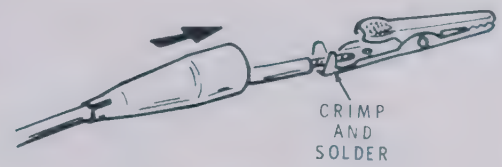
( ) Cut both leads of the 10 kΩ resistor (brown-black-orange), the 15 kΩ resistor (brown-green-orange), the 330 kΩ resistor (orange-orange-yellow), and the 1N4149 diode (#56-56) to 1/2".

( ) R2: Connect the 15 kΩ resistor (brown-green-orange) between switch SW2 lugs 2 (NS) and 4 (NS).

( ) D1: Connect the 1N4149 diode (#56-56) between switch SW2 lugs 4 (S-2) and 5(S-1). Be sure to connect the lead at the banded end of the diode to lug 4.

( ) R3: Connect the 10 kΩ resistor (brown-black-orange) from switch SW2 lug 8 (NS) to switch SW3 lug 6 (S-1).

( ) R1: Connect the 330 kΩ resistor (orange-orange-yellow) between switch SW2 lugs 1 (S-1) and 3 (NS)



Detail 1-9B

( ) Prepare the following wires:

Length	Wire
1-1/2"	Black solid
24"	Small red stranded
24"	Small black stranded

( ) Connect the 1-1/2" black solid wire from switch SW2 lug 2 (S-2) to switch SW3 lug 3 (S-1).

( ) Connect one end of the small red stranded wire to switch SW2 lug 3 (S-2).

( ) Refer to Detail 1-9B and slide an alligator clip insulator over the free end of the red wire.

( ) Install an alligator clip on the red wire. After the alligator clip cools, slide the insulator down over the clip.

( ) Connect one end of the small black stranded wire to switch SW2 lug 8 (S-2).

( ) Install an alligator clip on the free end of the wire.

( ) Position the chassis so that hole AA is as shown in Pictorial 1-9.

( ) Cut the six wires coming from hole AA in the front subpanel so no wire is more than 4" long. Measure the wire from where it comes out of the hole. Then remove 1/4" of insulation from each wire end.

( ) Look behind the front subpanel and locate the brown wire coming from grommet Q. Connect this wire to switch SW2 lug 6 (S-1).

Connect the remaining wires to the switches as follows:

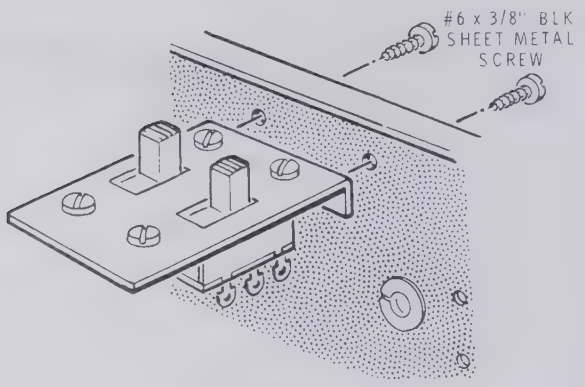
( ) Green to SW3 lug 1 (S-1).

( ) Orange to SW3 lug 2 (NS).

( ) Yellow to SW3 lug 4 (S-1).

( ) Brown to SW3 lug 5 (NS).

( ) Black to SW2 lug 9 (S-1).



Detail 1-9C

( ) Prepare a 15" red solid wire and a 15" black solid wire.

Connect the prepared wires to switch SW3 as follows:

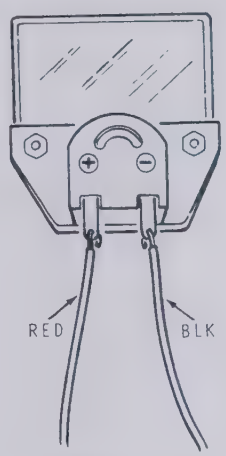
( ) Red to lug 2 (S-2).

( ) Black to lug 5 (S-2).

( ) Refer to Detail 1-9C and mount the test switch bracket to the front subpanel with two #6 x 3/8" black sheet metal screws as shown.

( ) Fold up the red and black wires and insert them into the plastic clamp.

( ) Temporarily remove a meter from its box and (if necessary) remove the shorting wire from its lugs.



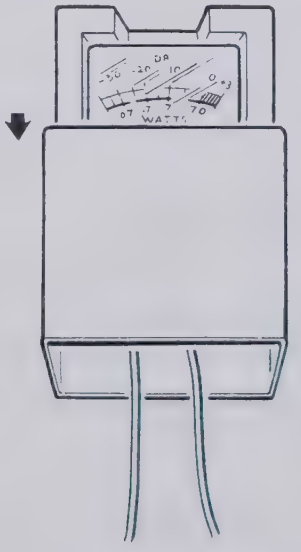
Detail 1-9D

Turn the meter over and connect the free ends of the red and black wires coming from the test switches to the meter as follows. See Detail 1-9D.

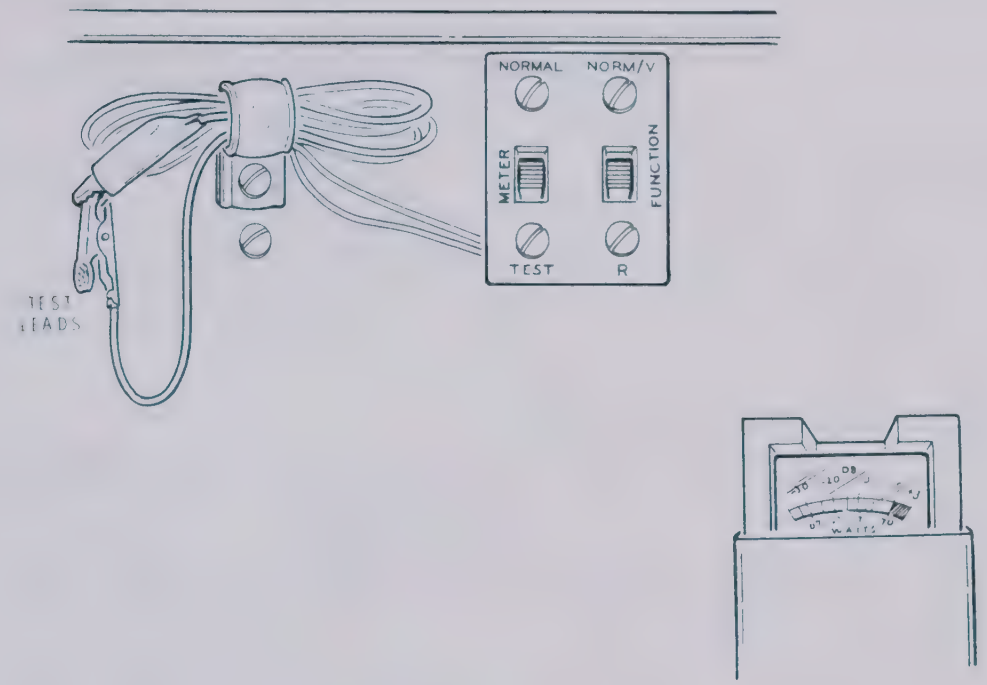
( ) Red to the positive (+) lug (S-1).

( ) Black to the negative (-) lug (S-1).

( ) Place the meter back in its carrier and slide on the cover as shown in Detail 1-9E. The meter will be used as the test meter when you check out your circuit boards.



Detail 1-9E



PICTORIAL 1-10

Meter Tests

Refer to Pictorial 1-10 for the following steps:

( ) Position both test switches to NORM.

WARNING: Hazardous high AC voltage is present when the line cord plug is connected. Hazardous high AC and DC voltages are present when the Amplifier is turned on. See Figure 1-1 (in the "Illustration Booklet").

NOTE: If you do not obtain the proper results in the following steps, unplug the line cord and proceed to "In Case of Difficulty" on Page 109.

( ) Plug the line cord to an AC outlet.

( ) Push the POWER switch to ON.

( ) Move the METER switch to TEST. The meter should not deflect.

( ) Move the FUNCTION switch to R. The meter should deflect to full scale or near full scale.

( ) Clip the black and red test leads together. The meter needle should drop back to the left side of the meter.

( ) Unclip the test leads and unplug the Amplifier line cord. (Do not turn the POWER switch off. In later steps, you will connect and disconnect the line cord to turn the Amplifier on and off.)

( ) Refold the test leads and insert them back into the plastic clamp.

Set the Amplifier aside temporarily.

Refer to Page 9 and the "Power Supply/Muting Circuit Board" Parts List. Follow the instructions there to unpack and check these parts.

POWER SUPPLY CIRCUIT BOARD

START

Position the Power Supply circuit board printed side up as shown. Then perform the steps in the order listed.

NOTE: Refer to Detail A in the "Illustration Booklet" when you install disc capacitors.

( ) C508: .01 μF disc.

( ) C507: .01 μF disc.

NOTE: Refer to Detail B when you install diodes.

( ) D505: 1N4002 diode (#57-65).

( ) D506: 1N4002 diode (#57-65).

( ) D503: 1N4002 diode (#57-65).

( ) C503: .01 μF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.

Refer to Detail C and install six #432-124 circuit board connectors. Solder each connector as you install it.

( ) J1 . . . . . .

( ) J2. . . . . .

( ) J3 . . . . . .

( ) J4 . . . . . .

( ) J5. . . . . .

( ) J6. . . . . .

( ) C502 .01 μF disc

( ) D501: 1N4002 diode (#57-65).

( ) D502: 1N4002 diode (#57-65).

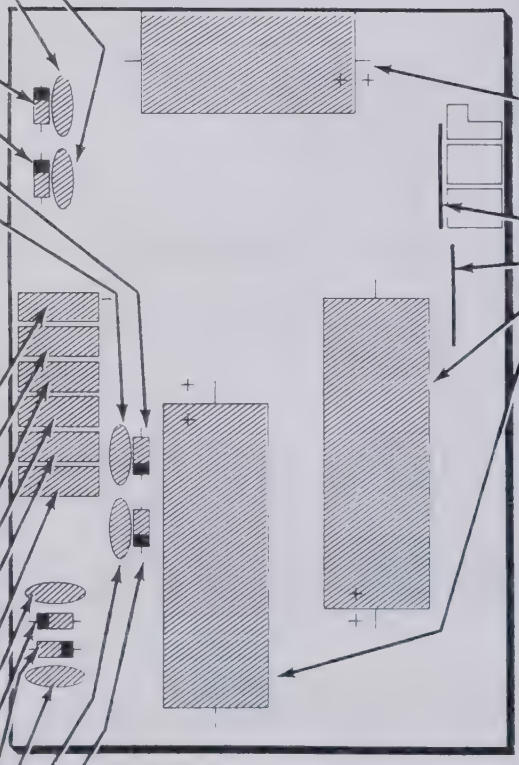
( ) C501: .01 μF disc.

( ) C504 .01 μF disc.

( ) D504: 1N4002 diode (#57-65).

( ) In the next step, save two of the cutoff capacitor leads for use later.

( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 2-1

CONTINUE

NOTE: Refer to Detail D when you install the following electrolytic capacitors.

( ) C509: 2000 μF electrolytic.

NOTE: Use two of the saved capacitor leads in the next two steps.

( ) 1-1/4" bare wire at J

( ) 1-1/4" bare wire at J

( ) C505: 500 μF electrolytic.

( ) C506: 500 μF electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions

( ) Unsoldered connections

( ) "Cold" solder connections

( ) Solder bridges between foil patterns

( ) Protruding leads which could touch together

( ) Electrolytic capacitors for the correct position of the positive (+) lead

( ) Diodes for the correct position of the banded end

FINISH

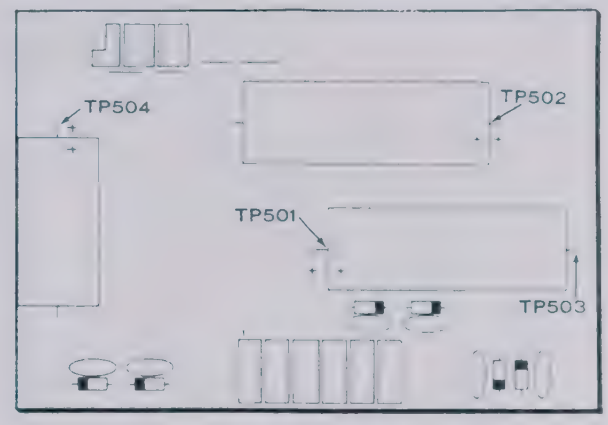
RESISTANCE TESTS

( ) Remove the test leads from the plastic clamp.

In the following steps, connect the test leads as instructed. If you do not obtain the proper meter reading, refer to the possible problems areas listed in the "Incorrect Reading, Check" column. Also, you can refer to "Checking Components" on Page 114 of the "In Case of Difficulty" section. Do not proceed to the following step until you obtain a correct meter reading. Some meter readings will change slowly, and then stop. This final reading is the one referred to in the step.

( ) Plug the line cord into an AC outlet.

Refer to Pictorial 2-2 for the following tests.



PICTORIAL 2-2

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK:
	BLACK TO:	RED TO:		
( )	TP501	TP502		1. D502 2. D504 3. C505
( )	TP501	TP503		1. D501 2. D503 3. C506
( )	TP501	TP504		1. D505 2. D506 3. C509

( ) Unplug the line cord, disconnect the test leads, and set the power supply circuit board aside.

The muting circuit board parts were packed with the power supply circuit board parts. Therefore, proceed to Page 34 and assemble the muting circuit board.

MUTING CIRCUIT BOARD

START

( ) Position the muting circuit board as shown and complete the following steps.

( ) 1-1/4" black solid wire.

( ) D52: 1N4002 diode (#57-65). See Detail B.

( ) D51: 1N4149 diode (#56-56).

( ) Solder the leads to the foil and cut off the excess lead lenghs.

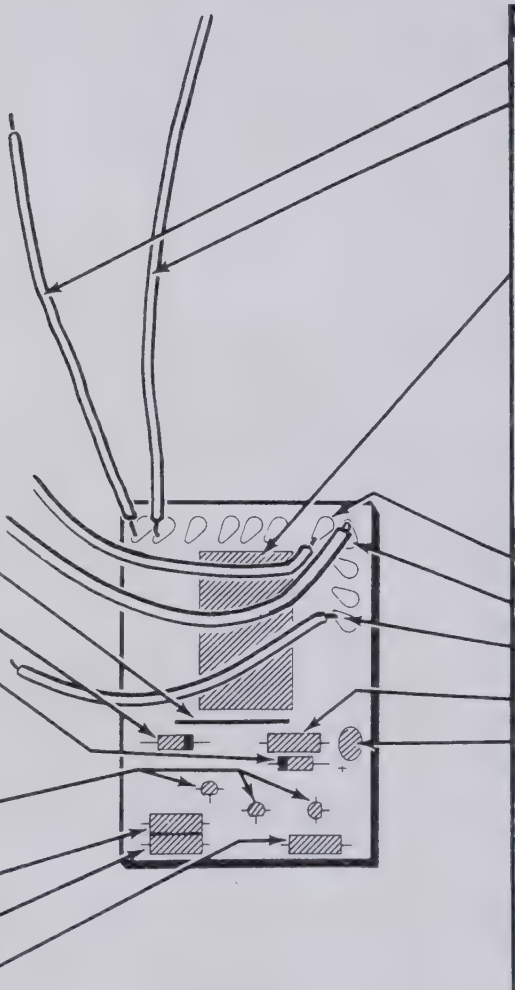
( ) Refer to Detail H1 and install MPSA20 transistors (#417-801) at Q51, Q52, and Q53

( ) R54: 10 kΩ (brown-black-orange).

( ) R53: 39 kΩ (orange-white-orange).

( ) R52: 100 kΩ (brown-black-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.

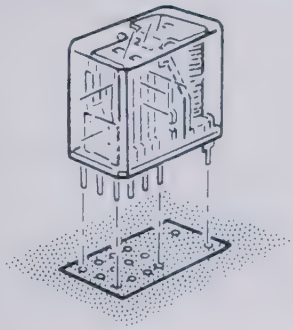


CONTINUE

( ) 4-1/2" medium black stranded wire.

( ) 9" medium red stranded wire.

( ) RY51: Relay.



( ) 5" medium brown stranded wire.

( ) 5" large blue stranded wire.

( ) 3" medium black stranded wire

( ) R57: 470 kΩ (yellow-violet-yellow)

( ) C51: 10 μF tantalum. See Detail G

( ) Solder the leads to the foil and cut off the excess lead lengths.

CIRCUIT BOARD CHECKOUT

Carefully inspect the power supply circuit board for the following conditions.

( ) Unsoldered connections

( ) "Cold" solder connections.

( ) Solder bridges between foils

( ) Protruding leads which could touch together

( ) Transistors for the proper type and installation

( ) Electrolytic capacitors for the correct position of the positive (+) end

( ) Diodes for the correct position of the banded end

FINISH

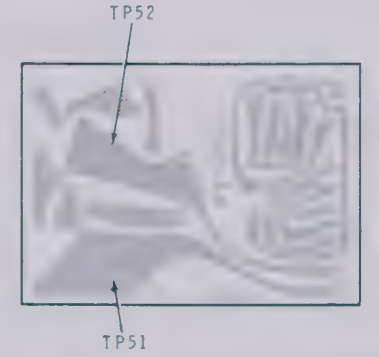
PICTORIAL 2-3

RESISTANCE TESTS

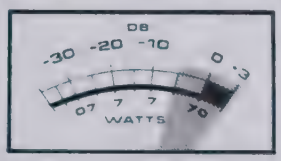
In the following steps, connect the test leads as instructed. If you do not obtain the proper meter reading, refer to the possible problems areas listed in the "Incorrect Reading, Check" column on Page 111 of the "In Case of Difficulty" section. Do not proceed to the following step until you obtain a correct meter reading. Some meter readings will change slowly, then stop. This final reading is the one referred to in the step.

( ) Plug the line cord into an AC outlet.

Refer to Pictorial 2-4 for the following tests.



PICTORIAL 2-4

CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK:
BLACK TO:	RED TO:		
TP51	TP52		1. D51 2. D52 3. Q51 4. Q52 5. Q53

( ) Unplug the line cord, disconnect the tests leads, and set the muting circuit board aside.

( ) Refer to Page 9 and the Meter Amplifier Circuit Board Parts List. Follow the instructions there to unpack and check those parts.

METER AMPLIFIER CIRCUIT BOARD

START

Position the meter amplifier circuit board as shown. Then perform the steps in the order listed.

( ) R411: 470 kΩ (yellow-violet-yellow).

NOTE: Refer to Detail B when you install diodes.

( ) D404: 1N4149 diode (#56-56).

( ) C403: .02 μF Mylar.

( ) C404: .0056 μF Mylar

( ) D403: 1N4149 diode (#56-56).

( ) R407: 1170 Ω (1.17K), 1% precision.

( ) R409: 500 Ω, 1% precision.

( ) R225: 6570 Ω (6.57 k), 1% precision.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) D401:1N4149 diode (#56-56).

( ) D402 1N4149 diode (#56-56).

( ) R406: 82 kΩ (gray-red-orange).

( ) R404 180 kΩ (brown-gray-yellow).

( ) C402: .1 μF disc.

( ) R405: 120 kΩ (brown-red-yellow).

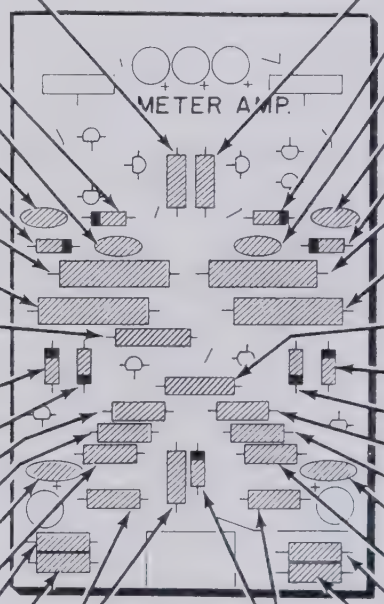
( ) R402: 470 Ω (yellow-violet-brown).

( ) R401: 10 kΩ (brown-black-orange).

( ) R403: 10 kΩ (brown-black-orange).

( ) R408: 1800 Ω (brown-gray-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) R422: 470 kΩ (yellow-violet yellow).

( ) D408: 1N4149 diode (#56-56)

( ) C409: .02 μF Mylar.

( ) C411: .0056 μF Mylar

( ) D407: 1N4149 diode (#56-56)

( ) R421: 1170 Ω (1.17K), 1% precision.

( ) R419: 500 Ω, 1% precision.

( ) R224 40 kΩ 1% precision

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) D405 1N4149 diode (#56-56)

( ) D406 1N4149 diode (#56-56)

( ) R418: 82 kΩ (gray-red-orange)

( ) R417 180 kΩ (brown-gray-yellow)

( ) C408: .1 μF disc.

( ) R416: 120 kΩ (brown-red-yellow)

( ) R414: 470 Ω (yellow-violet-brown)

( ) R413: 10 kΩ (brown-black-orange)

( ) R415: 10 kΩ (brown-black-orange)

( ) ZD407: 16.1V zener diode (#56-36)

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 3-1

START

In the following steps, solder each part to the foil as it is installed. Then cut off any excess lead lengths.

NOTE: Refer to Detail D when you install the following electrolytic capacitors.

( ) C412: 10 µF electrolytic.

( ) C406: 10 µF electrolytic.

( ) C405: 10 µF electrolytic.

( ) R412: 20 kΩ control.

NOTE: Refer to Detail E when you install #432-134 wire sockets.

( ) Wire socket at BLK.

( ) Wire socket at RED.

NOTE: Refer to Detail H-1 when you install transistors on this circuit board.

Install two MPS A20 (selected) transistors (#417-882).

( ) Q404

( ) Q403

Install three MPSA20 transistors (#417-801).

( ) Q405

( ) Q402

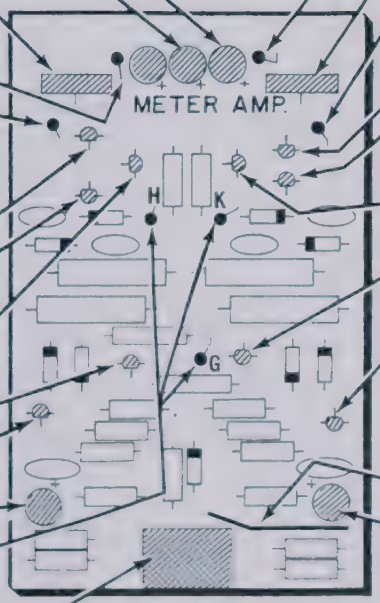
( ) Q401

( ) C401: 5 µF electrolytic.

( ) Install three wire sockets at H, K, and G.

NOTE: Refer to Detail F when you perform the next step.

( ) S401: Circuit board socket (#432-755).



PICTORIAL 3-2

CONTINUE

( ) Wire socket at YEL.

( ) R423: 20 kΩ control.

( ) Wire socket at GRN.

Install two MPS A20 (selected) transistors (#417-882).

( ) Q409

( ) Q408

Install three MPSA20 transistors (#417-801).

( ) Q410

( ) Q407.

( ) Q406.

NOTE: When you prepare a jumper wire, use the black solid wire supplied. Cut the wire to the lengths specified in the step and remove 1/4" of insulation from each end. Form the jumper as shown on the circuit board.

( ) 1-1/2" black wire at J.

( ) C407: 5 µF electrolytic.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) 'Cold' solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

( ) Electrolytic capacitors for the correct position of the positive (+) lead.

( ) Diodes for the correct position of the banded end.

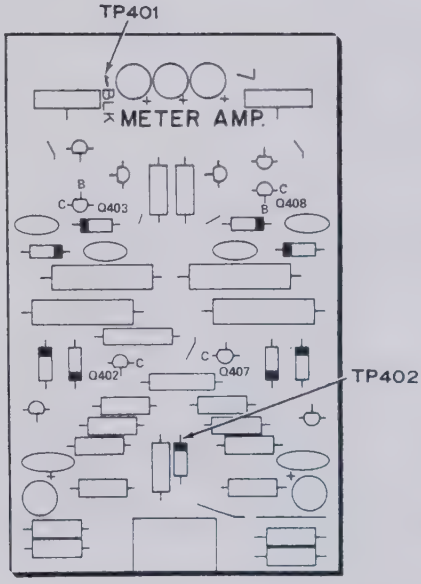
FINISH

RESISTANCE TESTS

Refer to Pictorial 3-3 for the following tests.

( ) Plug in the line cord.

Proceed to Page 39 and perform the tests. If you do not obtain the proper meter reading, refer to the possible problems areas listed in the "Incorrect Reading, Check" column. Also, you can refer to "Checking Components" on Page 114 of the "In Case of Difficulty" section. Do not proceed to a following step until you obtain a correct meter reading. Some meter readings will change slowly, and then stop. This final reading is the one referred to in the step.



PICTORIAL 3-3

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK:
	BLACK TO:	RED TO:		
( )	TP401	TP402		1. ZD407 2. C406
( )	TP401	C of Q402		1. Q402
( )	TP401	C of Q407		1. Q407
( )	TP401	B of Q403		1. Q403 2. D403 3. D404
( )	TP401	B of Q408		1. Q408 2. D407 3. D408
( )	TP401	C of Q403		1. Q403 2. Q404 3. Q305
( )	TP401	C of Q408		1. Q408 2. Q409 3. Q410

( ) Unplug the line cord, disconnect the test leads, and set the meter amplifier circuit board aside.

( ) Refer to Page 10 and the "Preamplifier Circuit Board" Parts List. Follow the instructions there to unpack and check those parts.

PREAMPLIFIER CIRCUIT BOARD

START

( ) Position the preamp circuit board lettered side up as shown. Then perform the steps in the order listed.

( ) R116: 680 Ω, 1-watt (blue-gray-brown).

( ) R117: 680 Ω, 1-watt (blue-gray-brown).

NOTE: Refer to Detail B when you install diodes.

( ) ZD101: 17 mA, 15V zener diode (#56-620)

( ) ZD102: 17 mA, 15V zener diode (#56-620).

( ) R104: 100 Ω (brown-black-brown).

( ) R102: 100 Ω (brown-black-brown).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R118: 270 kΩ (red-violet-yellow).

( ) R119: 1250 Ω (1.25K), 1% precision

( ) R105: 100 Ω (brown-black-brown).

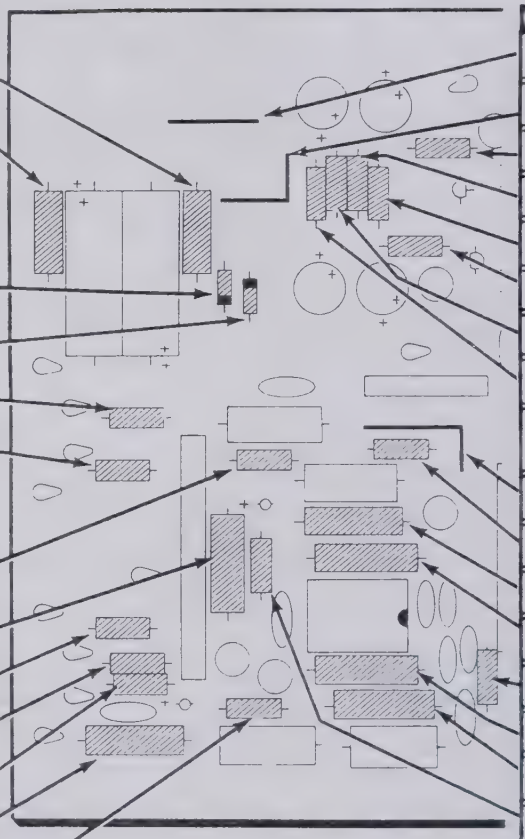
( ) R103: 100 Ω (brown-black-brown).

( ) R107: 47 kΩ (yellow-violet-orange).

( ) R108: 1250 Ω (1.25K), 1% precision.

( ) R109: 270 kΩ (red-violet-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) 1-1/8" black wire at J

( ) 1-1/4" black wire at J

( ) R145: 27 kΩ (red-violet-orange).

( ) R149: 6200 Ω (blue-red-red).

( ) R137: 6200 Ω (blue-red-red)

( ) R134: 27 kΩ (red-violet-orange)

( ) R148: 6200 Ω (blue-red-red)

( ) R136: 6200 Ω (blue-red-red)

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) 1-1/2" black wire at J

( ) R122: 33 Ω (orange-orange-black)

( ) R124: 80 kΩ, 1% precision.

( ) R123: 1 MΩ, 1% precision.

( ) R114: 33 Ω (orange-orange-black)

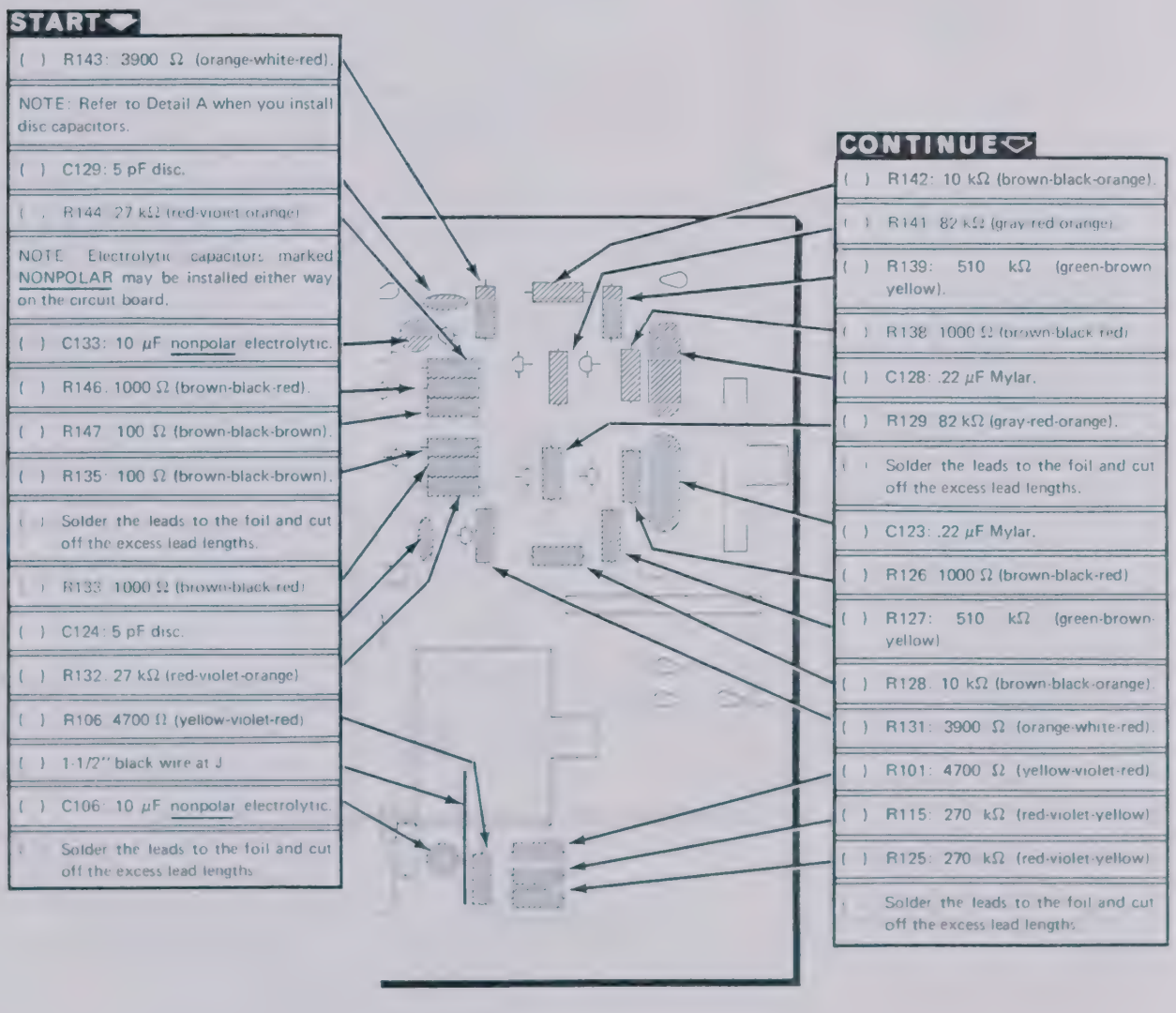
( ) R113: 1 MΩ, 1% precision.

( ) R112: 80 kΩ, 1% precision.

( ) R121: 47 kΩ (yellow-violet-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-1


START
( ) R143: 3900 Ω (orange-white-red).
NOTE: Refer to Detail A when you install disc capacitors.
( ) C129: 5 pF disc.
( ) R144: 27 kΩ (red-violet-orange).
NOTE: Electrolytic capacitors marked NONPOLAR may be installed either way on the circuit board.
( ) C133: 10 µF nonpolar electrolytic.
( ) R146: 1000 Ω (brown-black-red).
( ) R147: 100 Ω (brown-black-brown).
( ) R135: 100 Ω (brown-black-brown).
( ) Solder the leads to the foil and cut off the excess lead lengths.
( ) R133: 1000 Ω (brown-black-red).
( ) C124: 5 pF disc.
( ) R132: 27 kΩ (red-violet-orange).
( ) R106: 4700 Ω (yellow-violet-red).
( ) 1-1/2" black wire at J.
( ) C106: 10 µF nonpolar electrolytic.
( ) Solder the leads to the foil and cut off the excess lead lengths.
CONTINUE
( ) R142: 10 kΩ (brown-black-orange).
( ) R141: 82 kΩ (gray-red-orange).
( ) R139: 510 kΩ (green-brown-yellow).
( ) R138: 1000 Ω (brown-black-red).
( ) C128: .22 µF Mylar.
( ) R129: 82 kΩ (gray-red-orange).
( ) Solder the leads to the foil and cut off the excess lead lengths.
( ) C123: .22 µF Mylar.
( ) R126: 1000 Ω (brown-black-red).
( ) R127: 510 kΩ (green-brown-yellow).
( ) R128: 10 kΩ (brown-black-orange).
( ) R131: 3900 Ω (orange-white-red).
( ) R101: 4700 Ω (yellow-violet-red).
( ) R115: 270 kΩ (red-violet-yellow).
( ) R125: 270 kΩ (red-violet-yellow).
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-2

START

NOTE: Refer to Detail D when you install horizontal mounting electrolytic capacitors.

( ) C113: 100 μF electrolytic.

( ) C111: 100 μF electrolytic.

NOTE: Refer to Detail G when you install tantalum capacitors.

( ) C117: 39 μF tantalum. Note position of positive (+) lead.

( ) C115: 47 pF disc.

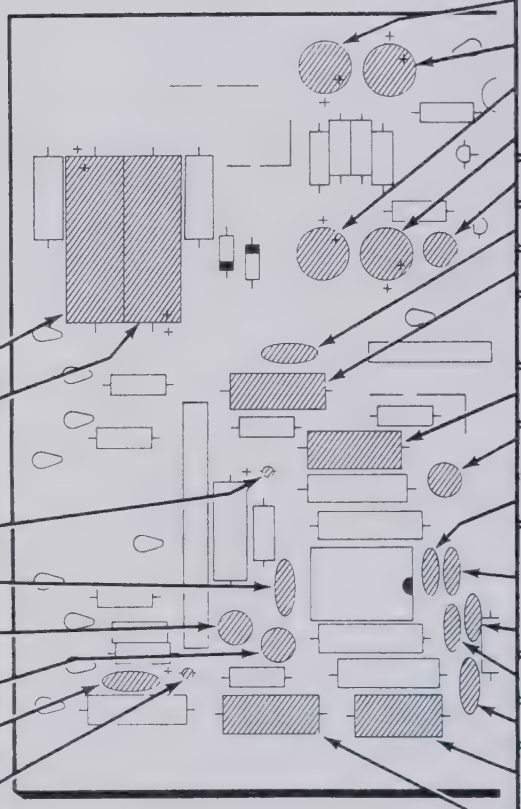
( ) C112: 10 μF nonpolar electrolytic.

( ) C101: 10 μF nonpolar electrolytic.

( ) C102: 47 pF disc.

( ) C103: 39 μF tantalum. Note the position of the positive (+) lead.

( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 4-3

CONTINUE

NOTE: Refer to Detail D when you install vertical mounting electrolytic capacitors.

install four 100 μF vertical mount electrolytic capacitors (#25-117).

( ) C132.

( ) C131.

( ) C125.

( ) C127.

( ) C126: 10 μF nonpolar electrolytic.

( ) C114: .1 μF disc.

( ) C116: .003 μF (3000) polystyrene.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) C118: .001 μF (1n or 1000) polystyrene.

( ) C122: 10 μF nonpolar electrolytic.

( ) C121: 15 pF disc.

Install two .01 μF capacitors.

( ) C119

( ) C107

( ) C108: 15 pF disc

( ) C109: .1 μF disc.

( ) C105: .001 μF (1n or 1000) polystyrene.

( ) C104: .003 μF (3000) polystyrene.

( ) Solder the leads to the foil and cut off the excess lead lengths

START

NOTE: Position the circuit board as shown for the following steps.

NOTE: Solder each transistor as it is installed and cut off the excess lead lengths.

NOTE: Refer to Detail H-2 when you perform the next two steps.

Install two 2N4121 transistors (#417-235).

( ) Q107.

( ) Q103.

NOTE: Refer to Detail H-1 when you install the following transistors.

( ) Q104: SM07275 transistor (#417-283).

( ) Q108 SM07275 transistor (#417-283)

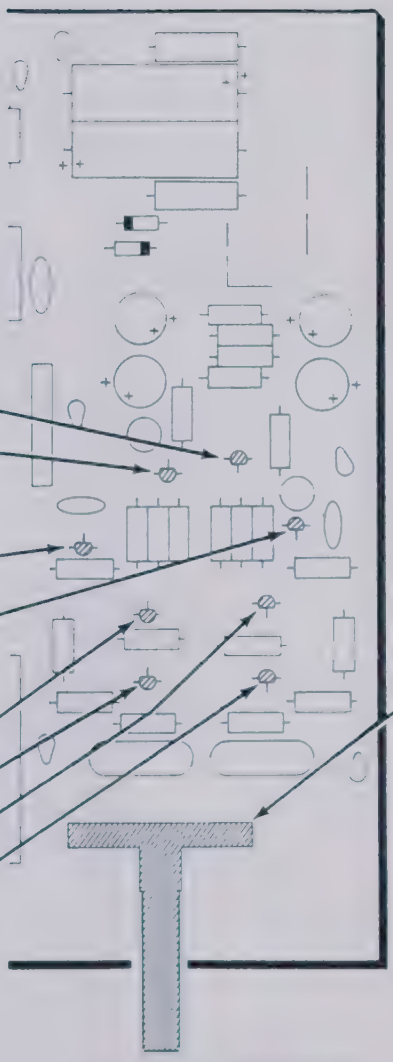
Install four SM62186 transistors (#417-284)

( ) Q102.

( ) Q101.

( ) Q106.

( ) Q105.



CONTINUE

( ) Refer to Part 1 of Detail J for the following steps

1. Straighten a control solder lug; then cut it to the length indicated
2. Mount another solder lug and the prepared solder lug on 1-wafer rotary switch #63-1248 with a control nut. Position the solder lugs as shown and tighten the nut
3. Check for any bent switch pins and straighten them if necessary

CAUTION: Be careful when you perform the next step. Be sure the switch solder lug and pins enter their respective holes and that they protrude through the circuit board.

( ) SW102: Refer to Part 2 of Detail J and carefully mount the prepared switch at the indicated location.

( ) Press the switch firmly against the circuit board. Then solder the switch pins to the foil. DO NOT SOLDER the control solder lug.

PICTORIAL 4-4

START

NOTE: You will mount a 14-pin IC socket in the next step. The pins are staggered so the socket will only mount one way. Be sure all of the socket pins are in their circuit board holes before you solder.

( ) Refer to Detail K and mount a 14-pin socket at IC101. Mount the socket as shown and solder the pins to the foil.

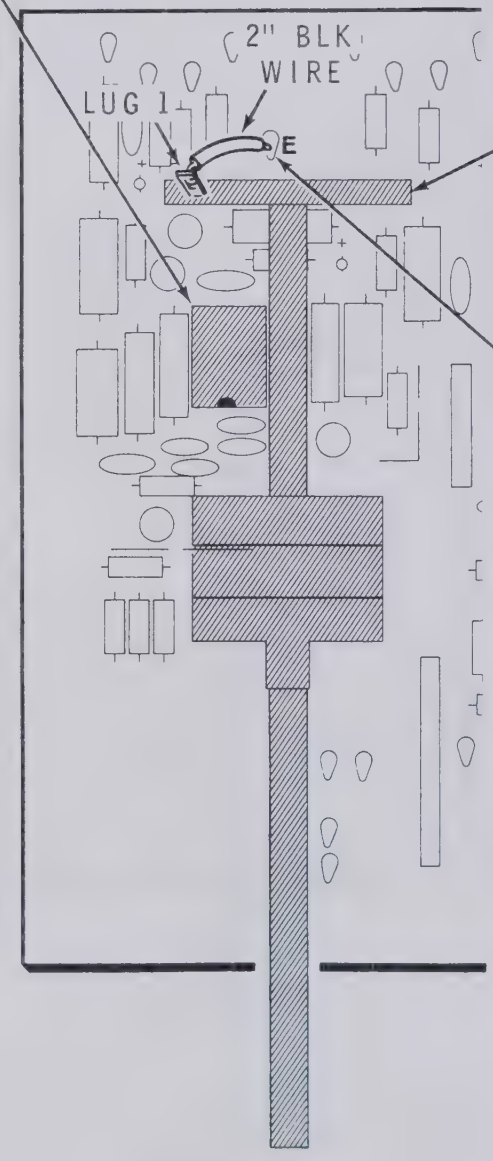
( ) IC101: UA739 integrated circuit (#442-615). NOTE: The indexed (pin 1) end of inline integrated circuits may be marked in a number of ways such as a notch, triangle, dot, the numeral 1, etc. See Detail L.

1. Hold the IC over its socket so the pin 1 end is over the index mark on the circuit board. If the pins do not line up with the socket holes, use small, long-nose pliers and carefully bend the pins until they are properly lined up.
2. Press the IC into its socket, but first make sure each IC pin is centered in its proper socket hole. See Detail M.

( ) Refer to Part 1 of Detail N for the following steps

1. Straighten a control solder lug as shown. Then cut it to the indicated length.
2. Mount another solder lug and the prepared solder lug on the 4-wafer rotary switch. Position the lug straight down as shown and tighten the control nut.
3. Check for any bent switch pins and straighten them if necessary.

CAUTION: Be very careful when you perform the next step. Be sure the control solder lug and all 26 switch pins enter their respective holes and that they protrude through the circuit board.



CONTINUE

( ) SW101: Refer to Part 2 of Detail N and mount the prepared 4-wafer switch on the circuit board.

( ) Press the switch firmly against the circuit board. Then solder the 26 pins to the foil. DO NOT SOLDER the control solder lug to the foil.

( ) 2" black wire from lug 1 of the switch to circuit board hole E. Solder the wire ends and cut off the excess wire lengths.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections

( ) "Cold" solder connections

( ) Solder bridges between foil patterns

( ) Protruding leads which could touch together.

( ) Transistors for the proper type and installation.

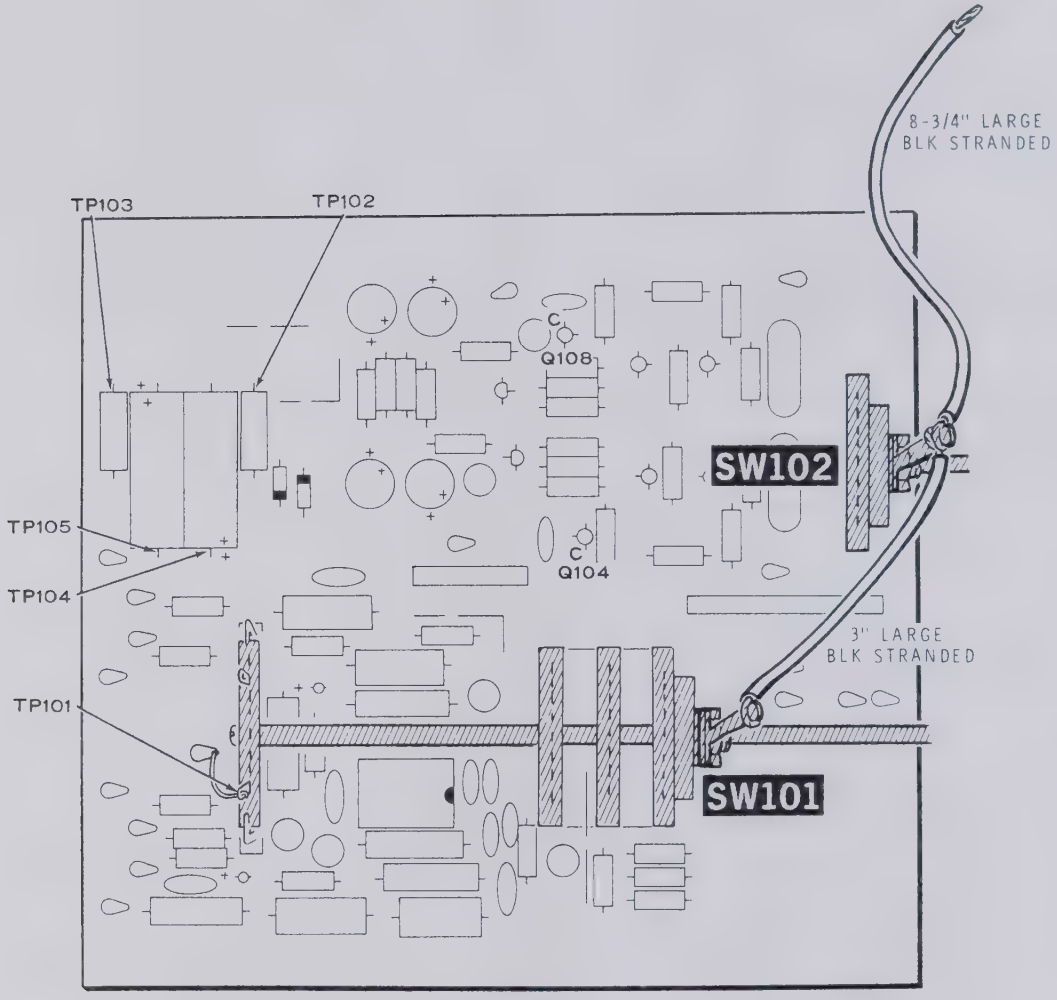
( ) Electrolytic capacitors for the correct position of the positive (+) lead

( ) Diodes for the correct position of the banded end

( ) Integrated circuit for proper installation.

FINISH

PICTORIAL 4-5



PICTORIAL 4-6

Refer to Pictorial 4-6 for the following steps.

( ) Cut a 3" length of large black stranded wire and remove 3/8" of insulation for each end.

( ) Connect the wire between the unused solder lugs of switches SW101 (S-1) and SW102 (NS).

( ) Cut an 8-3/4" length of large black stranded wire and remove 3/8" of insulation from each end.

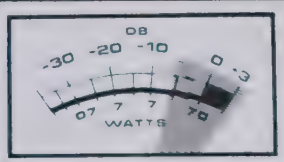
( ) Connect one end of the black wire to switch SW102 (S-2). The free end will be connected later.

( ) Set aside the remaining length of large black stranded wire.

Resistance Tests

In the following steps, if you do not obtain the proper meter reading, refer to ths possible problems areas listed in the "Incorrect Reading, Check" column. Also, you can refer to "Checking Components" on Page 114 of the "In Case of Difficulty" section. Do not proceed to a following step until you obtain a correct meter reading. Some meter readings will change slowly, and then stop. This final reading is the one referred to in the step.

( ) Plug in the line cord.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK:
	BLACK TO:	RED TO:		
( )	TP101	TP102		1. Solder bridges
( )	TP101	TP103		1. Solder bridges
( )	TP101	TP104		1. ZD101 2. C111
( )	TP101	TP105		1. ZD102 2. C113
( )	TP101	C of Q104		1. Q104 2. Q103 3. R134
( )	TP101	C of Q108		1. Q108 2. Q107 3. R145

( ) Unplug the line cord, disconnect the test leads, and set the preamplifier circuit board aside

( ) Refer to Page 12 and the "Tone Circuit Board" Parts List. Follow the instructions there to unpack and check those parts

TONE CIRCUIT BOARD

START

Position the tone circuit board lettered side up as shown. Then perform the steps in the order listed.

( ) R267: 270 Ω, **1-watt** (red-violet-brown).

( ) R268: 270 Ω, **1-watt** (red-violet-brown).

( ) R254: 1 MΩ (brown-black-green).

( ) R249: 27 kΩ (red-violet-orange).

( ) R248: 4700 Ω (yellow-violet-red).

( ) R221: 27 kΩ (red-violet-orange).

( ) 1" black wire at J.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R253: 15 kΩ (brown-green-orange).

( ) R251: 15 kΩ (brown-green-orange).

( ) R217: 15 kΩ (brown-green-orange).

( ) R215: 15 kΩ (brown-green-orange).

( ) R218: 4700 Ω (yellow-violet-red).

( ) R214: 150 kΩ (brown-green-yellow).

( ) R246: 150 kΩ (brown-green-yellow).

( ) 1" black wire at J.

( ) 1" black wire at J.

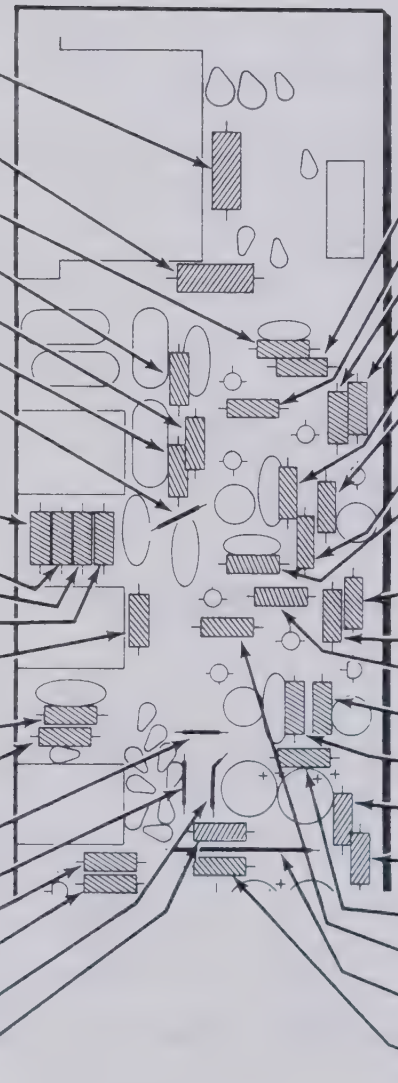
( ) R211: 100 Ω (brown-black-brown).

( ) R209: 1000 Ω (brown-black-red).

( ) 1" black wire at J.

( ) R244: 3300 Ω (orange-orange-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 5-1

CONTINUE

( ) R255: 82 kΩ (gray-red-orange).

( ) R256: 10 kΩ (brown-black-orange)

( ) R259: 1000 Ω (brown-black-red).

( ) R261: 100 Ω (brown-black-brown).

( ) R257: 1 MΩ (brown-black-green).

( ) R258: 27 kΩ (red-violet-orange).

( ) R262: 150 kΩ (brown-green-yellow).

( ) R222: 1 MΩ (brown-black-green).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R227: 100 Ω (brown-black-brown).

( ) R226: 1000 Ω (brown-black-red).

( ) R223: 82 kΩ (gray-red-orange).

( ) R228: 27 kΩ (red-violet-orange).

( ) R225: 1 MΩ (brown-black-green)

( ) R213: 3300 Ω (orange-orange-red).

( ) R245: 3300 Ω (orange-orange-red).

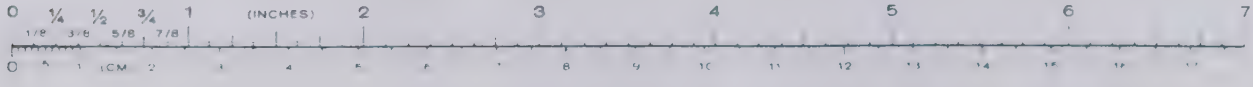
( ) R229: 150 kΩ (brown-green-yellow).

( ) R224: 10 kΩ (brown-black-orange).

( ) 1-5/8" black wire at J.

( ) R212: 3300 Ω (orange-orange-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.



START

( ) 1-1/8" black wire at J.

( ) R208: 27 kΩ (red-violet-orange).

( ) R207: 10 kΩ (brown-black-orange).

NOTE: Refer to Detail A when you install disc capacitors.

( ) C205: 5 pF disc.

( ) R242: 27 kΩ (red-violet-orange).

( ) R239: 10 kΩ (brown-black-orange)

( ) Remove the insulation from a 1-1/4" length of black wire. Then place a 3/4" length of teflon sleeving on the wire.

( ) Install the prepared wire at J

( ) 2-1/4" black wire at J. Form the wire as shown

( ) R206: 15 kΩ (brown-green-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) 2-5/8" black wire at J. Form the wire as shown.

( ) R203: 22 kΩ (red-red-orange).

( ) R205: 15 kΩ (brown-green-orange).

( ) R204: 51 kΩ (green-brown-orange)

( ) R201: 510 Ω (green-brown-brown).

( ) R202: 1 MΩ (brown-black-green).

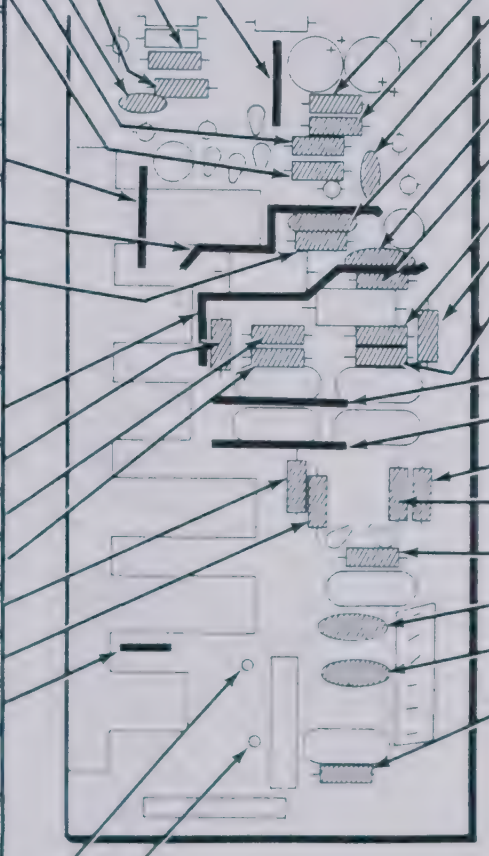
( ) 7/8" black wire at J

( ) Solder the leads to the foil and cut off the excess lead lengths

NOTE: Refer to Detail E when you install wire sockets in the following steps. Also, solder each wire socket when it is installed.

( ) Wire socket in hole BLK

( ) Wire socket in hole BRN



CONTINUE

( ) R243: 100 Ω (brown-black-brown).

( ) R241: 1000 Ω (brown-black-red).

( ) C224: 5 pF disc.

( ) C204: .001 μF disc (1000).

( ) C223: .001 μF disc (1000)

( ) R238: 15 kΩ (brown-green-orange).

( ) R237: 15 kΩ (brown-green-orange).

( ) R235: 22 kΩ (red-red-orange).

( ) R236: 51 kΩ (green-brown-orange).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) 1-3/8" black wire at J.

( ) 1-3/8" black wire at J.

( ) R233: 510 Ω (green-brown-brown).

( ) R234: 1 MΩ (brown-black-green).

( ) R265: 4700 Ω (yellow-violet-red).

( ) C218: .0022 μF disc (2200)

( ) C237: .0022 μF disc (2200)

( ) R266: 4700 Ω (yellow-violet-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 5-2

START

( ) C213: .047 µF Mylar.

( ) C232: .047 µF Mylar.

( ) C231: .047 µF Mylar.

NOTE: Electrolytic capacitors that are marked NONPOLAR may be mounted either way on the circuit board.

( ) C233: 10 µF nonpolar electrolytic.

( ) C228: 510 pF disc.

( ) C211: .2 µF disc.

( ) C214: 10 µF nonpolar electrolytic.

( ) C209: 510 pF disc.

NOTE: Refer to Detail D when you install the electrolytic capacitor in the following steps. Position the positive (+) lead as indicated on the Pictorial.

Install four 50 µF electrolytic capacitors (#25-116).

( ) C227. . . . . .

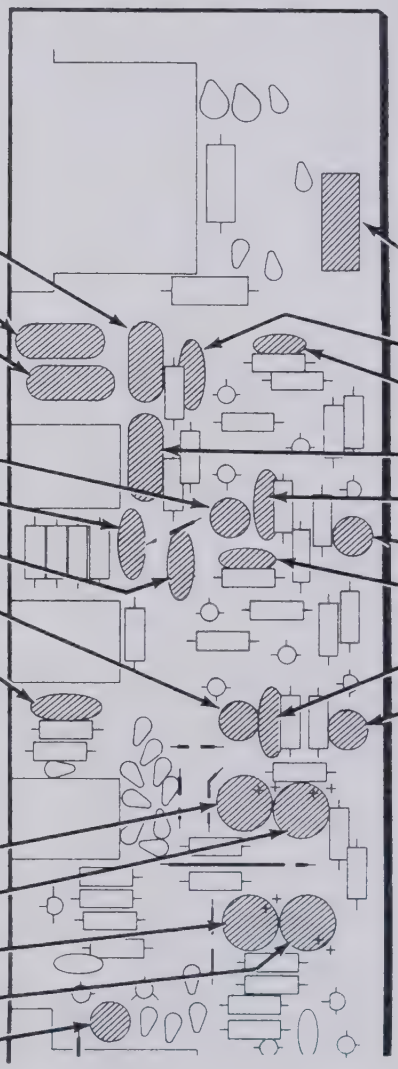
( ) C207. . . . . .

( ) C208. . . . . .

( ) C226. . . . . .

( ) C206: 10 µF nonpolar electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

NOTE: Refer to Detail P when you mount the circuit board plug in the next step. CAUTION: Do not overheat the plug pins when you solder them to the foil.

( ) PL201: Circuit board plug. Solder the pins to the foil. DO NOT cut off the excess pin lengths.

( ) C229: .2 µF disc.

( ) C234: 33 pF disc.

( ) C212: .047 µF Mylar.

( ) C235: .05 µF disc.

( ) C236: 10 µF nonpolar electrolytic.

( ) C215: 33 pF disc.

( ) C216: .05 µF disc.

( ) C217: 10 µF nonpolar electrolytic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 5-3

START

NOTE: Position the circuit board as shown for the following steps.

( ) C239: .1 μF Mylar.

( ) C238: .1 μF Mylar.

Install four .22 μF Mylar capacitors:

( ) C201.

( ) C219

( ) C221.

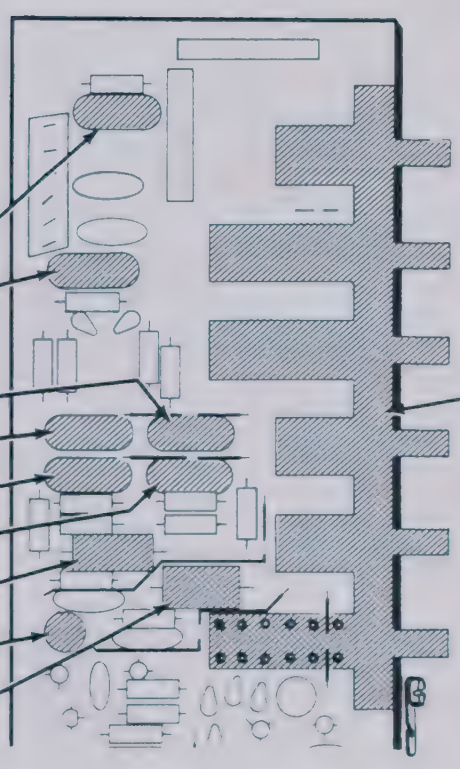
( ) C202.

( ) C222: .0027 μF (2700 pF) polystyrene.

( ) C225: 10 μF nonpolar electrolytic.

( ) C203: .0027 μF (2700 pF) polystyrene.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

NOTE: Refer to Detail Q for the following steps.

( ) Position the large switch assembly (#64-790) as shown in the Detail. Then mount a #6 solder lug on the end of the switch frame with a #5 × 3/8" self-tapping screw. Position the solder lug as shown in the Detail

( ) Inspect the longer pins on the switch and straighten any that are bent.

( ) SW201: Start the switch pins into their circuit board holes. Then press the assembly firmly against the circuit board until all of the switch pins are properly seated.

( ) Turn the circuit board over. Then at each end of the switch assembly, solder only two pins to the foil.

( ) Check the switch assembly. If it is properly seated, solder the rest of the pins to the foil. CAUTION: If there is no foil around a switch pin, DO NOT apply solder to that pin.

PICTORIAL 5-4

START

In the following steps, refer to the indicated Detail and insert the transistor leads into the proper holes in the circuit board; then solder the leads to the foil and cut off the excess lead lengths.

( ) Q210: SM07275 transistor (#417-283, Detail H-1).

( ) Q208: SM62186 transistor (#417-284, Detail H-1).

( ) Q209: 2N4121 transistor (#417-235, Detail H-2).

( ) Q203: SM07275 transistor (#417-283, Detail H-1).

( ) Q201: SM62186 transistor (#417-284, Detail H-1).

( ) Q202: 2N4121 transistor (#417-235, Detail H-2).

( ) Q207: SM07275 transistor (#417-283, Detail H-1).

( ) Q206: 2N4121 transistor (#417-235, Detail H-2).

( ) Q205: SM62186 transistor (#417-284, Detail H-1)

( ) Q204: SM62186 transistor (#417-284, Detail H-1).

( ) Q213: 2N4121 transistor (#417-235, Detail H-2)

( ) Q214: SM07275 transistor (#417-283, Detail H-1).

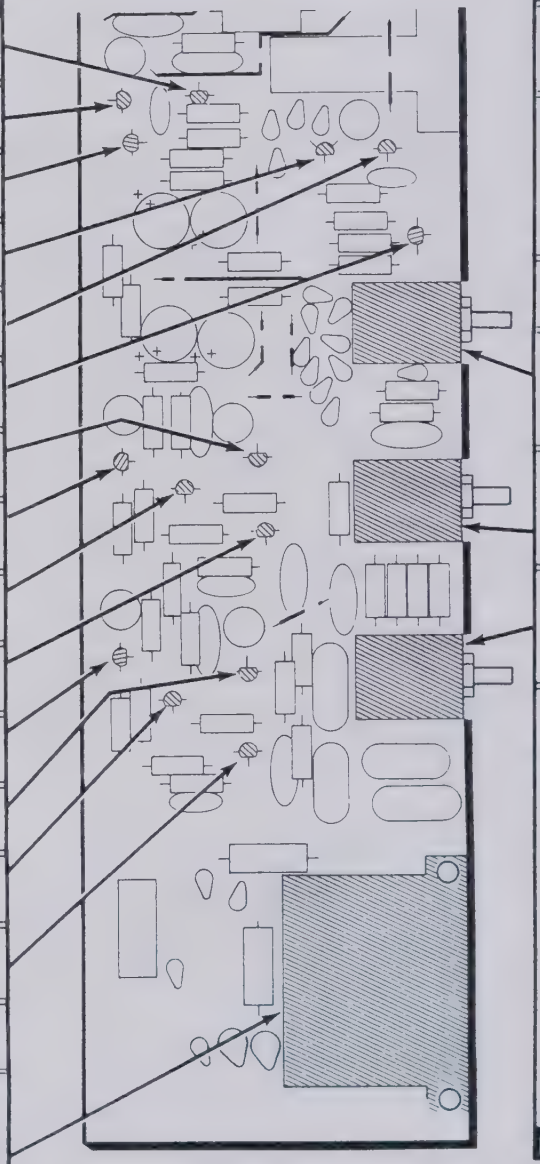
( ) Q212: SM62186 transistor (#417-284, Detail H-1)

( ) Q211: SM62186 transistor (#417-284, Detail H-1).

NOTE: Refer to Detail R for the following steps.

( ) SW202: Double switch assembly

1. From the foil side, secure the switch to the circuit board with one 4-40 × 5/16" self-tapping screw as shown
2. Solder the switch pins to the circuit board foil.



PICTORIAL 5-5

CONTINUE

NOTE: Refer to Detail S for the following steps.

( ) If the dual 25 kΩ and 100 kΩ controls have control nuts on them, remove and discard these control nuts.

( ) Refer to Part 1 of the Detail and prepare the dual 25 kΩ and 100 kΩ controls. Position the control solder lugs as shown and tighten the new control nuts. Set the controls aside until they are called for in a step.

Refer to Part 2 of Detail S for the following steps.

( ) R232/R264: Dual 25 kΩ control (#12-153). Press the control firmly against the circuit board. Then solder the pins to the foil

( ) R219/R247: Dual 100 kΩ control (#12-155). Press the control firmly against the circuit board. Then solder the pins to the foil.

( ) R216/R252: Dual 100 kΩ control (#12-155). Press the control firmly against the circuit board. Then solder the pins to the foil.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns

( ) Protruding leads which could touch together

( ) Transistors for the proper type and installation

( ) Electrolytic capacitors for the correct position of the positive (+) lead

FINISH

Refer to Pictorial 5-6 (in the "Illustration Booklet") for the following steps.

( ) Prepare the following solid wires.

1-1/2"	black
6"	bare
6"	black
4-1/2"	black

( ) Connect one end of a 1-1/2" black wire to control R232/R264 lug 7 (NS).

( ) Connect the other end of the wire in circuit board hole W (S-1).

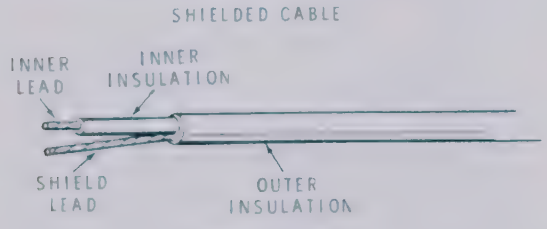
( ) Connect one end of the 6" bare wire to switch SW201 lug 13 (S-1).

NOTE: When a wire passes through a connection and goes on to another point as in the next step, it will count as two wires (S-2) in the solder instructions. Be sure this "through" wire as well as all other wires at that point are properly soldered.

( ) Insert the free end of the bare wire through control R232/R264 lug 7 (S-3); then through control R219/R247 lug 7 (S-2), and on to control R216/R252 lug 7 (S-1).

( ) Connect a 6" black wire from switch SW201 lug 9 (S-1) to circuit board hole RT OUT (S-1).

( ) Connect a 4-1/2" black wire from switch SW201 lug 4 (S-1) to circuit board hole LT OUT (S-1).



Detail 5-6A

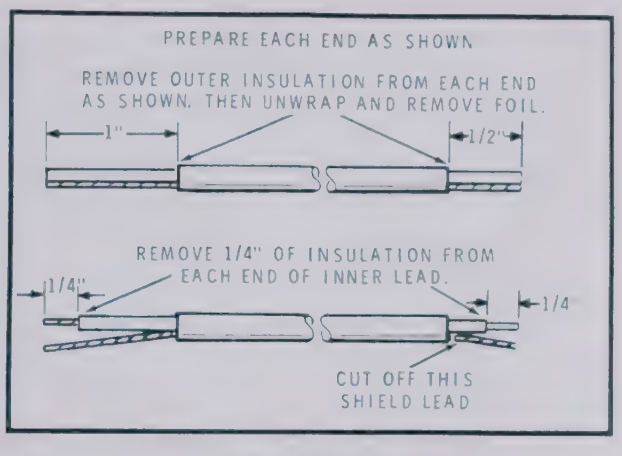
NOTES:

1. Detail 5-6A identifies the leads of the shielded cables you will prepare in the following steps.

2. Detail 5-6B shows how each end of each shielded cable should be prepared. The lengths of the cables are specified in the next step.

( ) Refer to Detail 5-6B and prepare the following lengths of shielded cable.

Four 4" lengths.
Four 5" lengths.
Four 6" lengths.


PREPARE EACH END AS SHOWN
REMOVE OUTER INSULATION FROM EACH END AS SHOWN. THEN UNWRAP AND REMOVE FOIL.
1"
1/2"
REMOVE 1/4" OF INSULATION FROM EACH END OF INNER LEAD.
1/4"
1/4
CUT OFF THIS SHIELD LEAD

Detail 5-6B

NOTE: In the following steps, you will connect one end of each shielded cable to the TONE circuit board. Solder each cable as it is installed, then cut off the excess lead length (or lengths).

Connect the *2-lead end* of six shielded cables in holes 1 through 6 at location S-N on the circuit board as directed in the steps in the following chart. CAUTION: Be sure you install the shield leads in the row of holes marked S and the inner leads in the row of holes marked N.

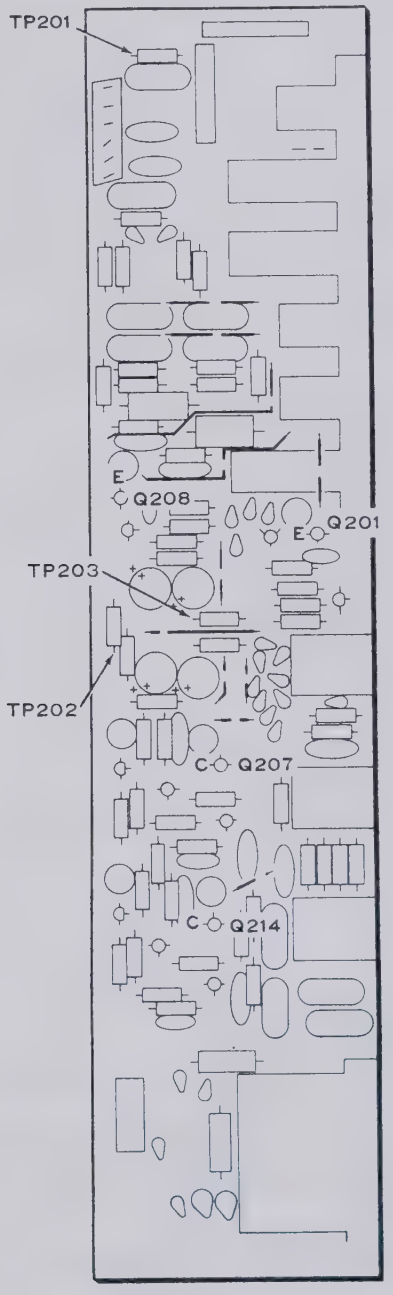
	Cable length:	Shield lead in hole:	Inner lead in hole:
( )	5"	S1	N1
( )	5"	S2	N2
( )	6"	S3	N3
( )	6"	S4	N4
( )	5"	S5	N5
( )	5"	S6	N6

The free ends of these cables will be connected later.

Connect the single lead end of the remaining prepared shielded cables in holes 1 through 6 at location R on the circuit board as directed in the steps in the following chart.

	Cable length:	Inner lead in hole:
( )	4"	R1
( )	6"	R2
( )	4"	R3
( )	6"	R4
( )	4"	R5
( )	4"	R6

The free ends of these cables will be connected later.



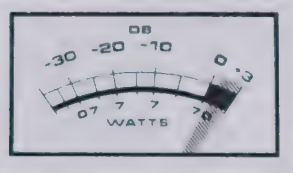
PICTORIAL 5-7

Resistance Tests

Refer to Pictorial 5-7 for the following steps.

In the following steps, if you do not obtain the proper meter reading, refer to the possible problems areas listed in the "Incorrect Reading, Check" column. Also, you can refer to "Checking Components" on Page 114 of the "In Case of Difficulty" section. Do not proceed to a following step until you obtain a correct meter reading. Some meter readings will change slowly, and then stop. This final reading is the one referred to in the step.

( ) Plug in the line cord.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK:
	BLACK TO:	RED TO:		
( )	TP201	TP202		1. Solder bridges
( )	TP201	TP203		1. Solder bridges
( )	TP201	E of Q201		1. Q201 2. Q202 3. Q203
( )	TP201	E of Q208		1. Q208 2. Q209 3. Q210
( )	TP201	C of Q207		1. Q207 2. Q206
( )	TP201	C of Q214		1. Q213 2. Q214

( ) Unplug the line cord, disconnect the test leads, and set the tone circuit board aside.

( ) Refer to Page 13 and the "Output Amplifier Circuit Board" Parts List. Follow the instructions there to unpack and check those parts

OUTPUT AMPLIFIER CIRCUIT BOARD

NOTE : This kit uses identical output amplifier circuit boards. Each step on the following Pictorials has two sets of checkoff brackets. Use one set when you assemble the first circuit board and the other set when you assemble the second circuit board.

START

Position the Output Amplifier circuit board as shown. Then perform the steps in the order listed

( ) ( ) R717: 150 Ω (brown-green-brown).

( ) ( ) C706: 05 μF disc. See Detail A.

( ) ( ) R714: 820 Ω (gray-red-brown).

( ) ( ) R735:10 Ω (brown-black-black).

( ) ( ) R713: 2200 Ω (red-red-red).

NOTE: Refer to Detail B when you install diodes

( ) ( ) ZD701: 1N750A zener diode (#56-59).

( ) ( ) C703: 250 μF nonpolar electrolytic.

( ) ( ) R712 15 kΩ, 1-watt (brown-green-orange).

( ) ( ) D702: MZ2362 diode (#56-74).

( ) ( ) R711: 15 kΩ (brown-green-orange).

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) ( ) R704: 680 Ω (blue-gray-brown).

( ) ( ) R706: 2700 Ω (red-violet-red).

( ) ( ) R710:1000 Ω (brown-black-red).

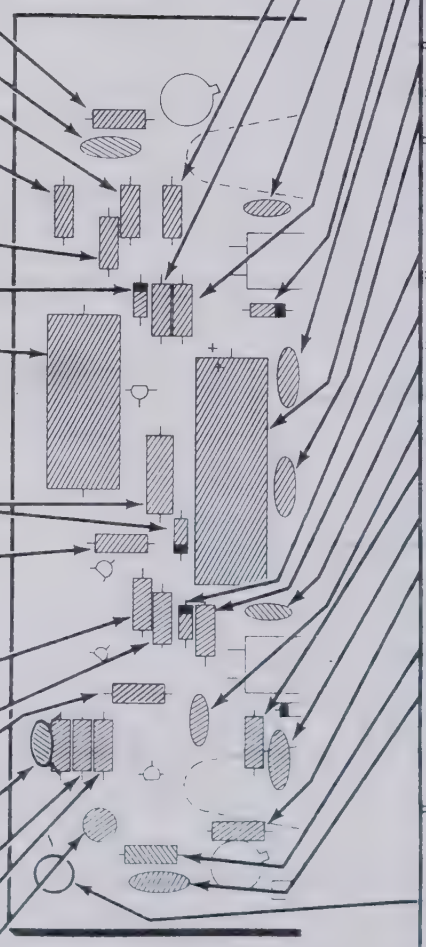
( ) ( ) R702: 33 kΩ (orange-orange-orange) 100 pF disc combination. See Detail T

( ) ( ) R701 1000 Ω (brown-black-red).

( ) ( ) R705 2700 Ω (red-violet-red)

( ) ( ) C701: 10 μF nonpolar electrolytic.

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 6-1

CONTINUE

( ) ( ) R715: 100 Ω (brown-black-brown).

( ) ( ) R703: 6800 Ω (blue-gray-red).

( ) ( ) C713: 100 pF disc.

( ) ( ) R716: 22 Ω (red-red-black).

( ) ( ) D703: MZ2360 diode (#56-73).

( ) ( ) C712: .01 μF disc.

NOTE: Refer to Detail D when you mount an electrolytic capacitor.

( ) ( ) C702: 100 μF electrolytic.

( ) ( ) C707: .05 μF disc.

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) ( ) D707: MZ2360 diode (#56-73).

( ) ( ) R724. 39 Ω (orange-white-black).

( ) ( ) C718: 100 pF disc.

( ) ( ) C704: 10 pF disc

( ) ( ) R708: 68 Ω (blue-gray-black).

( ) ( ) C708: .05 μF disc.

( ) ( ) R709: 1000 Ω (brown-black-red).

( ) ( ) R707: 15 Ω (brown-green-black).

( ) ( ) C705 .05 μF disc

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths. Save one cutoff lead.

( ) ( ) Refer to Detail U and, from the foil side, mount a phono socket in the circuit board hole marked "INPUT." Position the lug as shown in the Detail and solder the socket to the foil.

( ) ( ) Bend the socket lug over as shown. Then use the cutoff lead and connect it from the socket lug (S-1) to the indicated hole in the circuit board (S-1). Cut off the excess lead.

START

( ) ( ) R728: 68 Ω (blue-gray-black).

( ) ( ) R729: 75 Ω (violet-green-black).

( ) ( ) C714: .01 μF disc.

( ) ( ) 1-1/2" black wire at J.

( ) ( ) R717: 15 Ω (brown-green-black).

( ) ( ) R718: 1000 Ω (brown-black-red).

( ) ( ) D705: MZ2360 diode (#56-73).

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) ( ) C711: .02 μF disc.

( ) ( ) R719: 4700 Ω (yellow-violet-red).

( ) ( ) D706: MZ2360 diode (#56-73).

( ) ( ) R721: 1000 Ω (brown-black-red).

( ) ( ) D704: MZ2360 diode (#56-73).

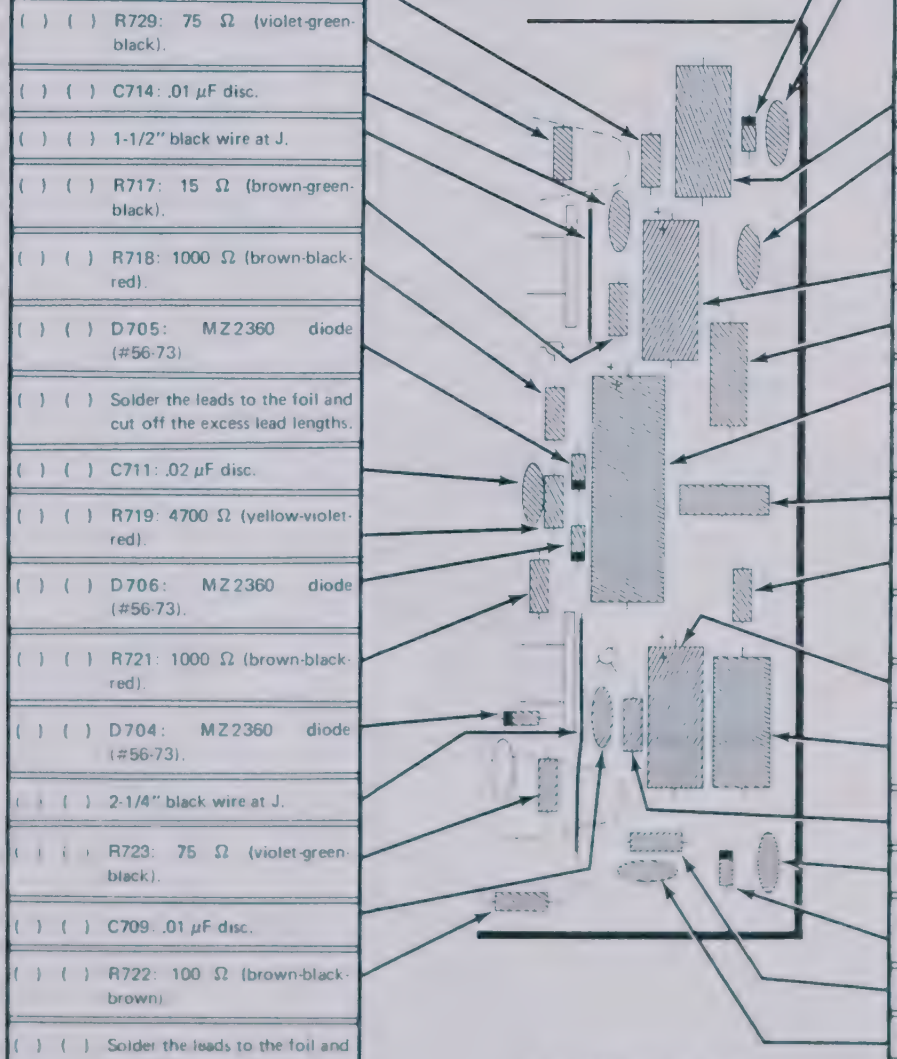
( ) ( ) 2-1/4" black wire at J.

( ) ( ) R723: 75 Ω (violet-green-black).

( ) ( ) C709: .01 μF disc.

( ) ( ) R722: 100 Ω (brown-black-brown).

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 6-2

CONTINUE

( ) ( ) D708: 1N4002 diode (#57-65).

( ) ( ) C721: .1 μF disc.

NOTE: Refer to Detail V for the next step.

( ) ( ) Place 1/2" lengths of teflon sleeving on both leads of a .33 Ω, 5-watt resistor.

( ) ( ) R731: .33 Ω, 5-watt resistor.

( ) ( ) C723: .1 μF disc.

NOTE: Refer to Detail D when you mount electrolytic capacitors.

( ) ( ) C715: 250 μF electrolytic.

( ) ( ) R734: 20 Ω (red-black-black) 2-watt resistor.

( ) ( ) C722: 100 μF electrolytic.

NOTE: Refer to Detail W for the next step.

( ) ( ) L701: 3 μH toroid (#40-958)

( ) ( ) R733: 10 Ω (brown-black-black).

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) ( ) C716: 250 μF electrolytic.

( ) ( ) R732: .33 Ω 5-watt See Detail V and use 1/2" lengths of sleeving

( ) ( ) R726: 15 Ω (brown-green-black).

( ) ( ) C719: .1 μF disc.

( ) ( ) D709: 1N4002 diode (#57-65).

( ) ( ) R725: 68 Ω (blue-gray-black).

( ) ( ) C717: .01 μF disc.

( ) ( ) Solder the leads to the foil and cut off the excess lead lengths.

START

NOTE: Refer to Detail H-4 for the next step.

( ) ( ) Q706: RCA1A16 transistor (#417-870).

NOTE: Refer to the appropriate section of Detail H when you install the following transistors.

( ) ( ) Q707: MPS-A20 transistor (#417-801). See Detail H-5.

Refer to Detail H-6 and install four TZ852 transistors (#417-221) as follows:

( ) ( ) Q703. . . . . .

( ) ( ) Q708. . . . . .

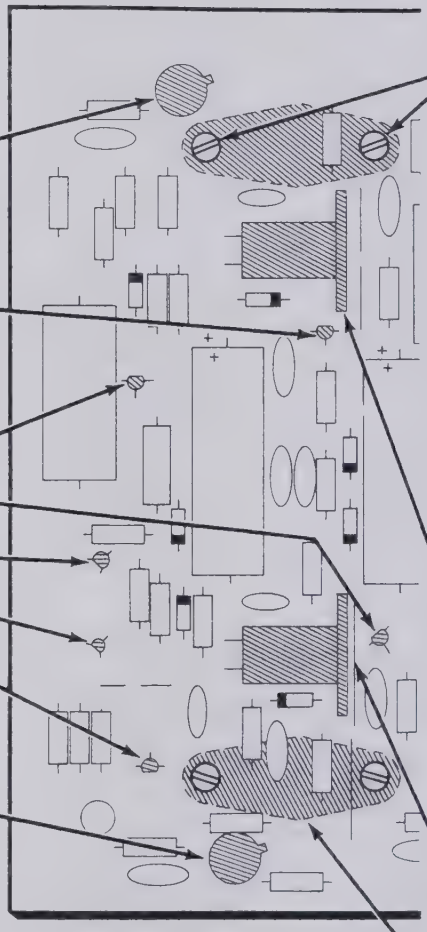
( ) ( ) Q702. . . . . .

( ) ( ) Q701. . . . . .

( ) ( ) Q704: MPS-L01 transistor (#417-811). See Detail H-5.

NOTE: Refer to Detail H-4 for the next step.

( ) ( ) Q705: RCA1A16 transistor (#417-870).



PICTORIAL 6-3

CONTINUE

NOTE: Refer to Detail X for the following steps.

( ) ( ) Insert 6-32 x 3/8" screws through holes C at location Q710. Then from the foil side of the board, place a #6 lockwasher and tapped spacer on each screw. Tighten both screws securely.

( ) ( ) Position a transistor socket as shown and insert the socket pins in their circuit board holes. Temporarily secure the socket to the spacers with 6-32 x 3/8" screws. Solder the socket pins to the foil; then remove and save these two screws.

Refer to Detail H-7 for the next two steps.

( ) ( ) Prepare the RCA29C transistor (#417-868) as shown in Part 1 of the Detail.

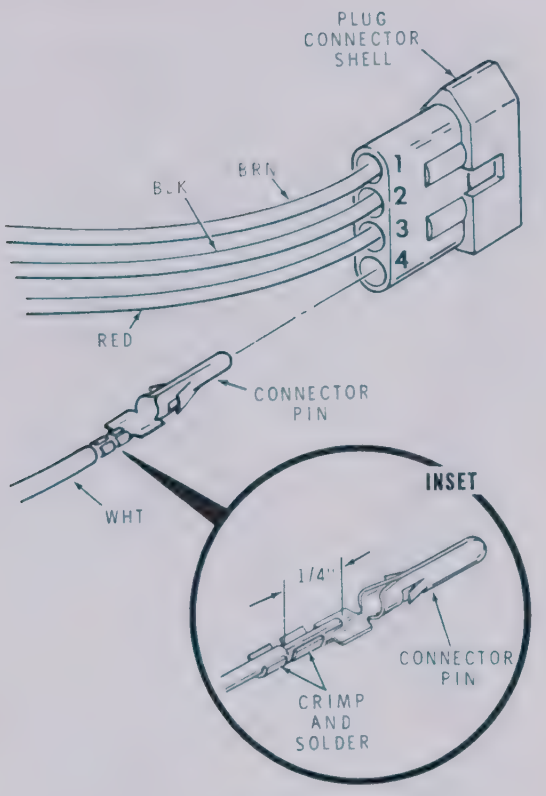
( ) ( ) Q709: Refer to Part 2 of the Detail and mount a heat sink and the prepared transistor. Be sure the transistor pins are in their circuit board holes and the heat sink is properly positioned; then tighten the mounting screw.

( ) ( ) Solder the pins to the foil and cut off the excess pin lengths.

( ) ( ) Q711: In the same manner, prepare and mount the RCA30C transistor (#417-869) at Q711.

( ) ( ) Again refer to Detail X and mount a transistor socket on the foil side of the circuit board at location Q712.

( ) ( ) Solder the socket pins to the foil. Then remove the 6-32 x 3/8" screws. (NOTE: After you perform this step on the second circuit board, you may discard these two screws.



PICTORIAL 6-4

Refer to Pictorial 6-4 for the following steps.

NOTE: Each of the following steps has two sets of checkoff brackets. Use one set when you complete this group of steps for the first circuit board and the other set when you complete this group of steps for the second circuit board.

( ) ( ) Prepare the following medium stranded wires:

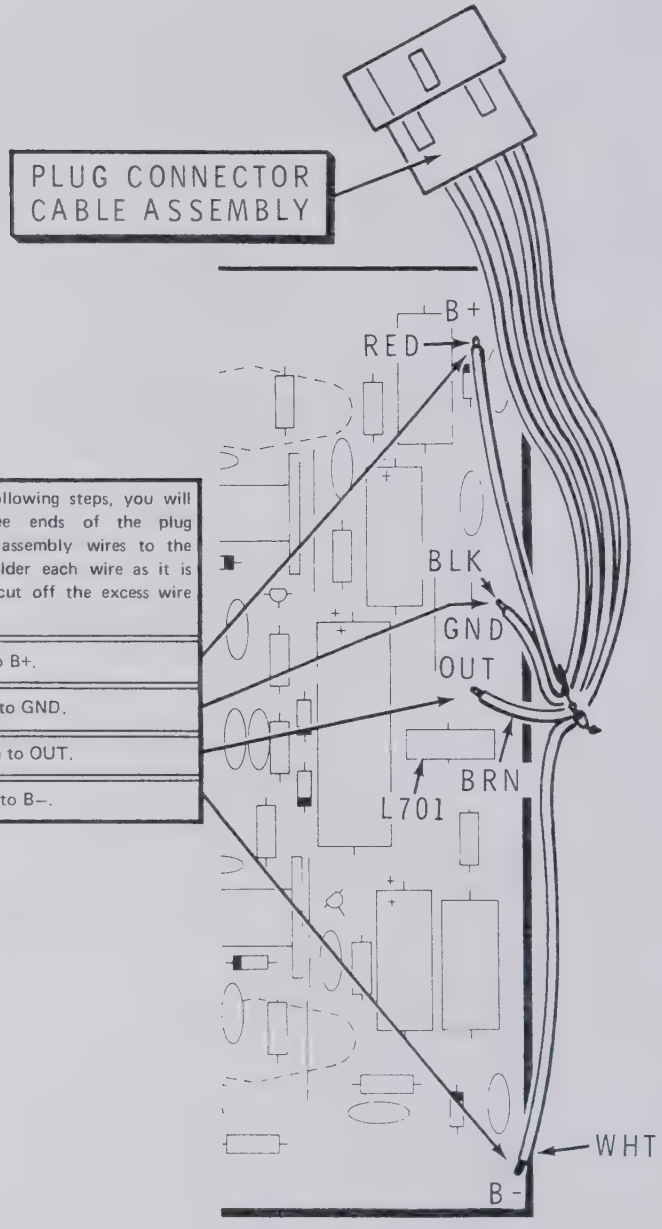
9" brown
9" black
11" red
12" white

( ) ( ) Refer to the inset drawing on the Pictorial and install a connector pin on one end of each of the prepared wires. Twist the wires and use only a small amount of solder.

( ) ( ) Insert the connector pin on the white wire into hole 4 of the plug connector shell. Press the pin in until it locks (clicks) in place in the shell. (NOTE: If you get the wrong connector in a hole, use the pin extractor to remove the connector, as shown in Part B of Detail 1-4B on Page 24.)

( ) ( ) In the same manner, insert the connector pins on the red, black, and brown wires into holes 3, 2, and 1 respectively of the connector shell.

Proceed to Pictorial 6-5.



START

NOTE: In the following steps, you will connect the free ends of the plug connector cable assembly wires to the circuit board. Solder each wire as it is connected; then cut off the excess wire length.

( ) ( ) Red to B+.

( ) ( ) Black to GND.

( ) ( ) Brown to OUT.

( ) ( ) White to B–.

CONTINUE

( ) ( ) Group the wires together near inductor L701. Then refer to Detail Y and place a cable tie around the wires as shown.

( ) ( ) Pull on the cable tie until it is tight around the wires. Then cut off the excess tie length.

CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

( ) ( ) Unsoldered connections.

( ) ( ) "Cold" solder connections.

( ) ( ) Solder bridges between foil patterns.

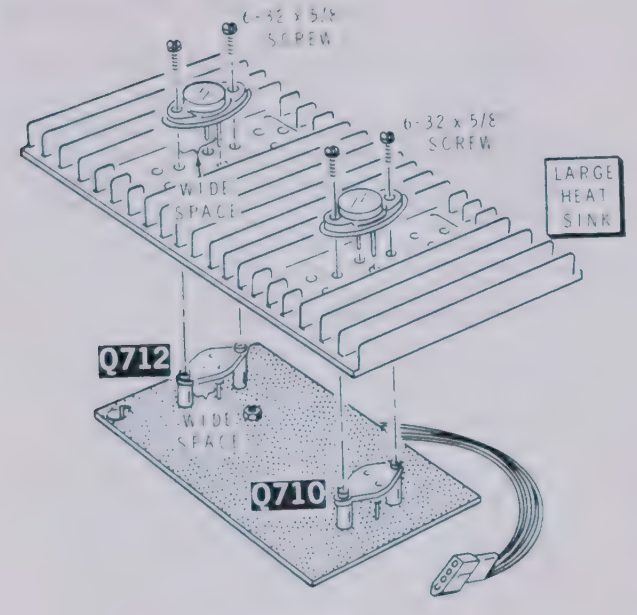
( ) ( ) Protruding leads which could touch together.

( ) ( ) Transistors for the proper type and installation.

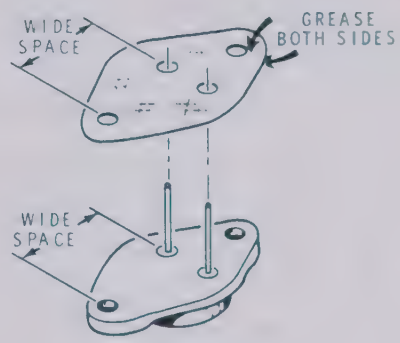
( ) ( ) Electrolytic capacitors for the correct position of the positive (+) lead.

( ) ( ) Diodes for the correct position of the banded end.

PICTORIAL 6-5



PICTORIAL 6-6



Detail 6-6A

In the following steps, you will mount a large heat sink and two power transistors on each of the output amplifier circuit boards. Note that the holes in the heat sinks are "off center" and must match the holes in the transistor sockets on the circuit boards.

Refer to Pictorial 6-6 for the following steps.

( ) ( ) Check the pins of two MJ802 transistors (#417-254). Straighten the pins if they are bent.

( ) ( ) Push a transistor into socket Q712. Then remove it. (This will make the final transistor installation easier.)

( ) ( ) Push the other transistor into socket Q710. Then remove it.

( ) ( ) Locate one of the silicone grease pods and make a small slit in one side. Remove the grease by squeezing the pod.

( ) ( ) Apply a coat of grease on both sides of a large transistor insulator. Then refer to Detail 6-6A and place the insulator on one MJ802 power transistor (#417-254)

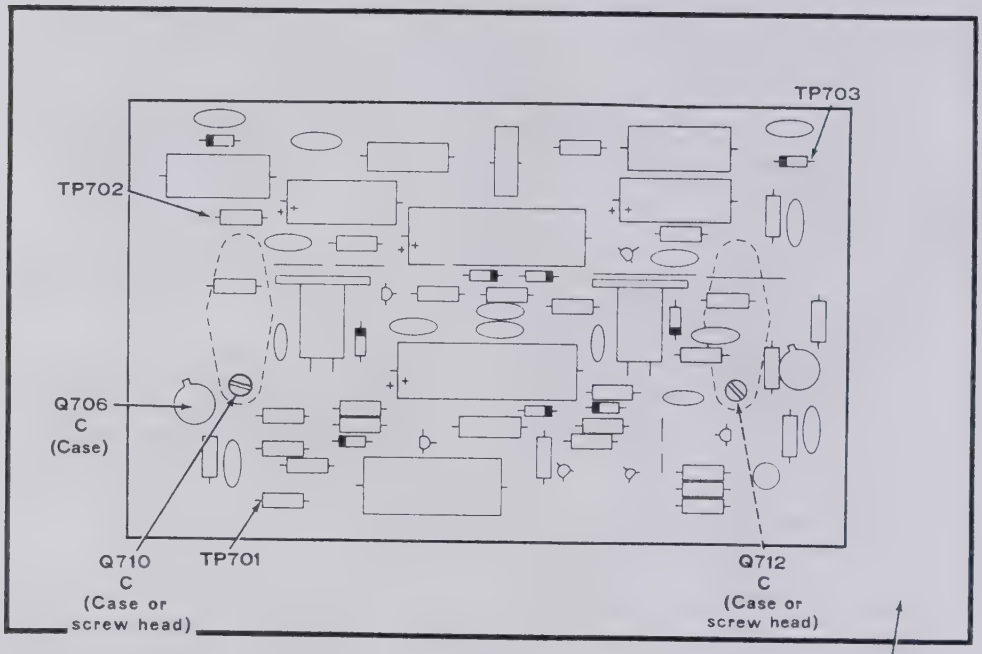
( ) ( ) In the same manner apply grease to another large transistor insulator and place it on another MJ802 transistor (#417-254)

( ) ( ) Position the output amplifier circuit board assembly as shown. Then place the large heat sink on the transistor sockets using the centermost group of heat sink holes. Be sure the socket and heat sink holes line up and the socket shoulders are properly seated in the holes in the heat sink.

( ) ( ) Hold the circuit board/heat sink assembly and carefully start the pins on one of the prepared power transistors into the holes in the transistor socket at location Q712. Then press the transistor firmly against the heat sink.

( ) ( ) Q712: Secure the transistor to the assembly with 6-32 × 5/8" screws. CAUTION: Be sure the socket shoulders are seated in the heat sink holes BEFORE you tighten the mounting screws.

( ) ( ) Q710: In the same manner, mount another prepared power transistor at location Q710.



PICTORIAL 6-7

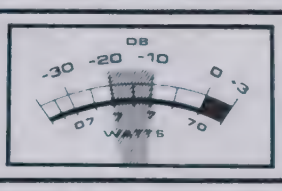
RESISTANCE TESTS

Refer to Pictorial 6-7 for the following tests.

In the following steps, if you do not obtain the proper meter reading, refer to the possible problems areas listed in the "Incorrect Reading, Check" column. Also, you can refer to "Checking Components" on Page 114 of the "In Case of Difficulty" section. Do not proceed to a following step until you obtain a correct meter reading. Some meter readings will change slowly, and then stop. This final reading is the one referred to in the step.

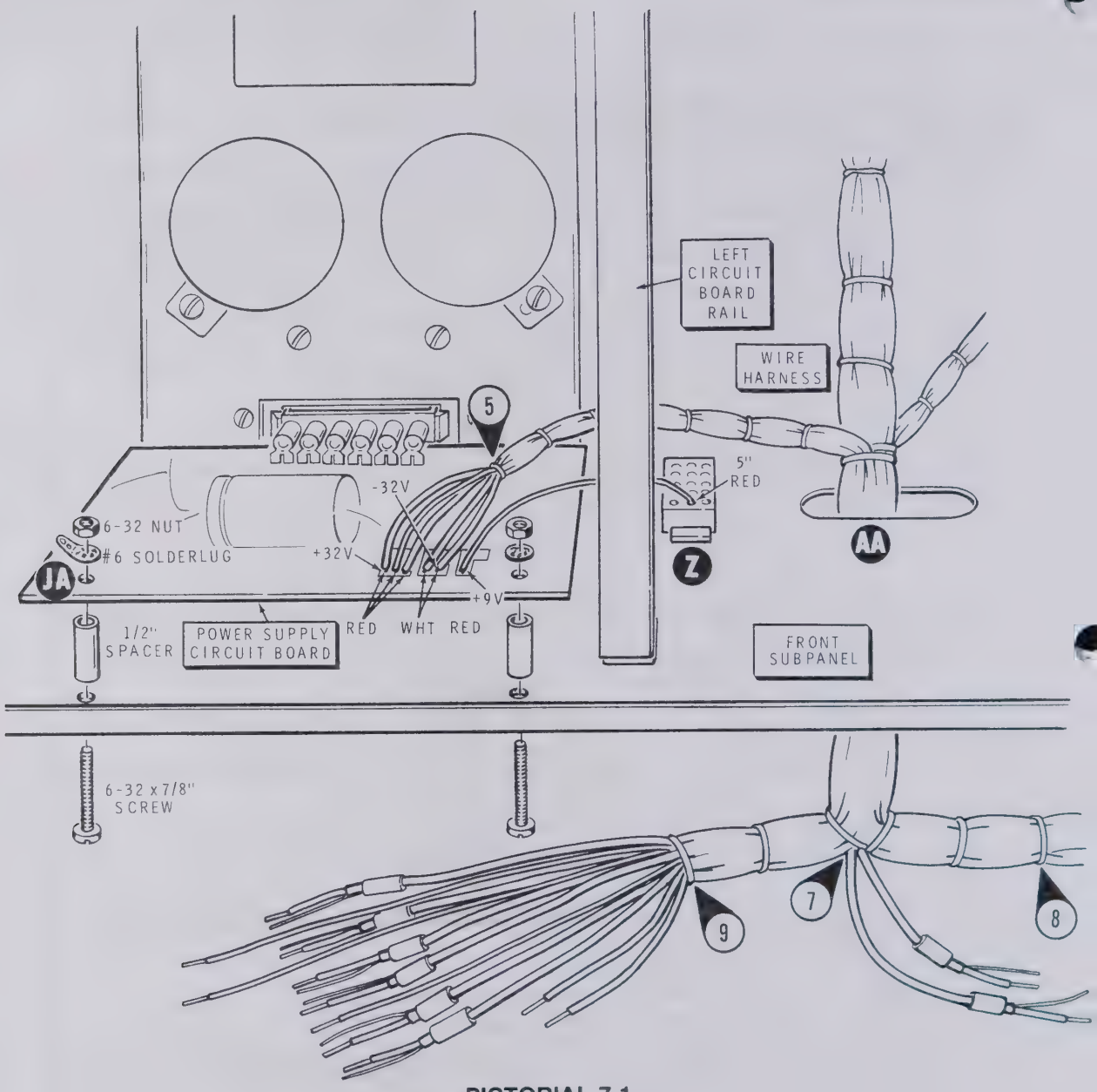
( ) Plug in the line cord.

Perform the following tests twice; once on each circuit board.

	CONNECT TEST LEAD		METER INDICATION	INCORRECT READING, CHECK:
	BLACK TO:	RED TO:		
( )( )	TP701	TP702		1. Solder bridges
( )( )	TP701	TP703		1. Solder bridges
( )( )	TP701	C of Q706 (Transistor Case)		1. Q706 2. Q709 3. Q703 4. Q705 5. Q711
( )( )	TP701	C of Q712 (Transistor Case or screw head)		1. Q712 2. Q710
( )( )	TP704	C of Q712 (Transistor Case or screw head)		1. Q712
( )( )	TP704	C of Q710 (Transistor Case or screw head)		1. Q710

( ) Unplug the line cord, disconnect the test leads, and set the circuit boards aside

( ) Refer to Page 15 and the "Final Pack" Parts List. Follow the instructions there to unpack and check those parts



PICTORIAL 7-1

CIRCUIT BOARD INSTALLATION

Refer to Pictorial 7-1 for the following steps.

NOTE: Be careful with the test meter whenever you reposition the chassis.

( ) Refer to Detail 7-1A and position the wire harness as shown. Some of the wire colors refer to color bands on shielded cables.

( ) From the rear of the front subpanel, insert BO's (break-outs) 7, 8, and 9 through front subpanel hole AA.

( ) Position BO #5 under the left circuit board rail.

Connect and solder the wires from BO#5 to the power supply circuit board as follows:

( ) Three red wires to three holes + 32V (S-3).

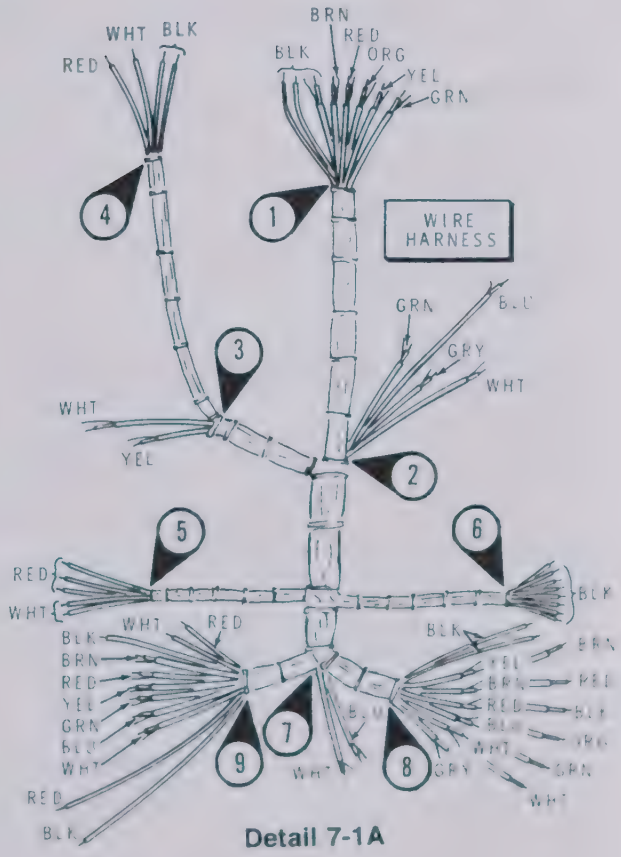
( ) Two white wires to two holes - 32V (S-2).

( ) Cut the red wire coming from socket Z to 5". Measure it from where it comes out of the socket and remove 1/4" of insulation.

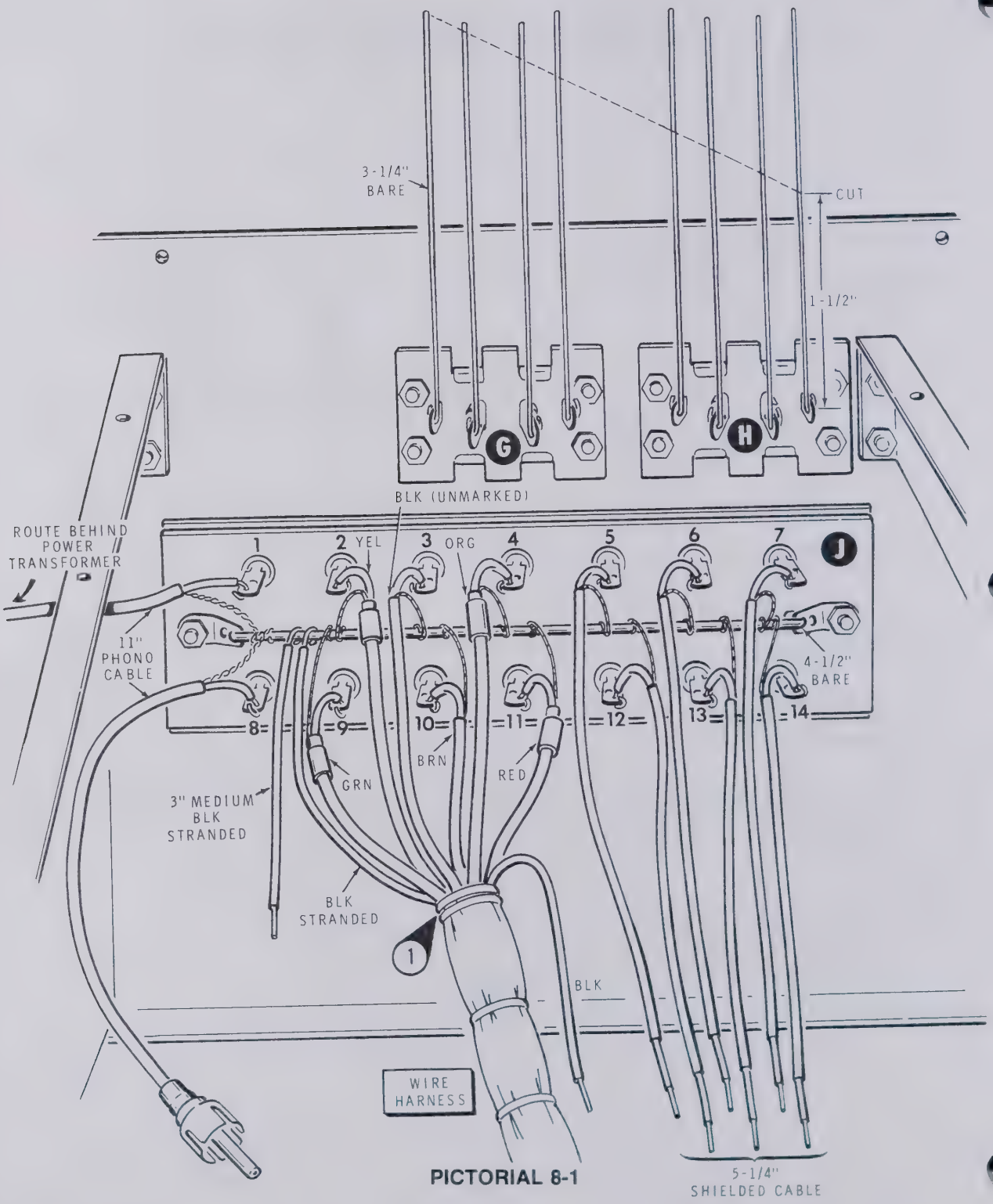
( ) Route this red wire under the left circuit board rail and connect it to power supply circuit board hole + 9V (S-1).

( ) Cut off the excess wire lengths from the foil side of the circuit board.

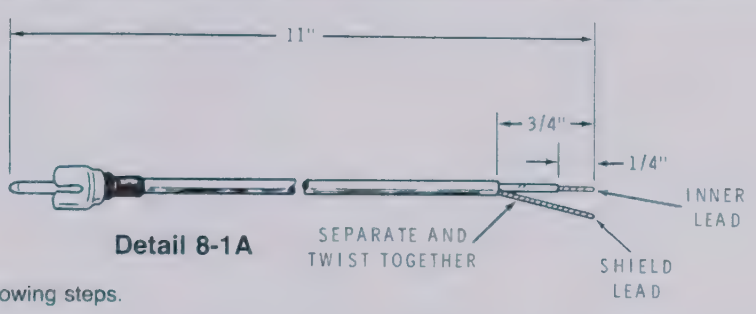
( ) Refer to Pictorial 7-1 and plug in and secure the power supply circuit board. Use two 6-32 × 7/8" screws, two 1/2" spacers, a #6 solder lug, a #6 lockwasher, and two 6-32 nuts. Position the solder lug at JA as shown.



Detail 7-1A



PICTORIAL 8-1



Detail 8-1A

Refer to Pictorial 8-1 for the following steps.

( ) Cut a 4-1/2" length of large bare wire and connect it between the two solder lugs at J and solder the connections. Bend the wire out away from the socket assembly.

( ) Refer to Detail 8-1A, cut a phono cable to 11", and prepare the end as shown.

( ) In the same manner, prepare another 11" phono cable.

Connect the prepared phono cables to phono socket assembly J as follows:

( ) Inner lead of either cable to lug 8 (S-1); shield lead to bare wire (S-1).

( ) Inner lead of other cable to lug 1 (S-1); shield lead to bare wire (S-1). Route this cable behind the power transformer as shown.

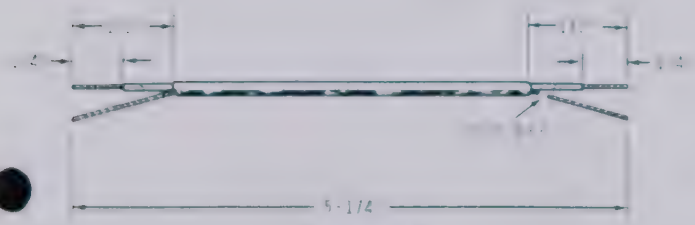
( ) Prepare a 3" medium black stranded wire and connect it to the bare wire as shown (S-1). The free end will be connected later.

Connect the color-marked shielded cables coming from wire harness BO#1 to phono socket assembly J as follows. Be careful that you do not burn the insulation of nearby cables.

( ) Green: Inner lead to lug 9 (S-1); shield lead to bare wire (S-1).

( ) Brown: Inner lead to lug 10 (S-1); shield lead to bare wire (S-1).

( ) Red: Inner lead to lug 11 (S-1). Shield lead to bare wire (S-1).



Detail 8-1B

( ) Yellow: Inner lead to lug 2 (S-1); shield lead to bare wire (S-1).

( ) Black (unmarked): Inner lead to lug 3 (S-1); shield lead to bare wire (S-1).

( ) Orange: Inner lead to lug 4 (S-1); shield lead to bare wire (S-1).

( ) Connect either black stranded wire to the bare wire at the location shown (S-1). The other wire will be connected later.

( ) Refer to Detail 8-1B and prepare six 5-1/4" lengths of shielded cable as shown.

Connect the prepared lengths of shielded cable to phono socket assembly J as follows. The free ends will be connected later.

( ) Inner lead to lug 12 (S-1); shield lead to bare wire (S-1).

( ) Inner lead to lug 13 (S-1); shield lead to bare wire (S-1).

( ) Inner lead to lug 14 (S-1); shield lead to bare wire (S-1).

( ) Inner lead to lug 5 (S-1); shield lead to bare wire (S-1).

( ) Inner lead to lug 6 (S-1); shield lead to bare wire (S-1).

( ) Inner lead to lug 7 (S-1); shield lead to bare wire (S-1).

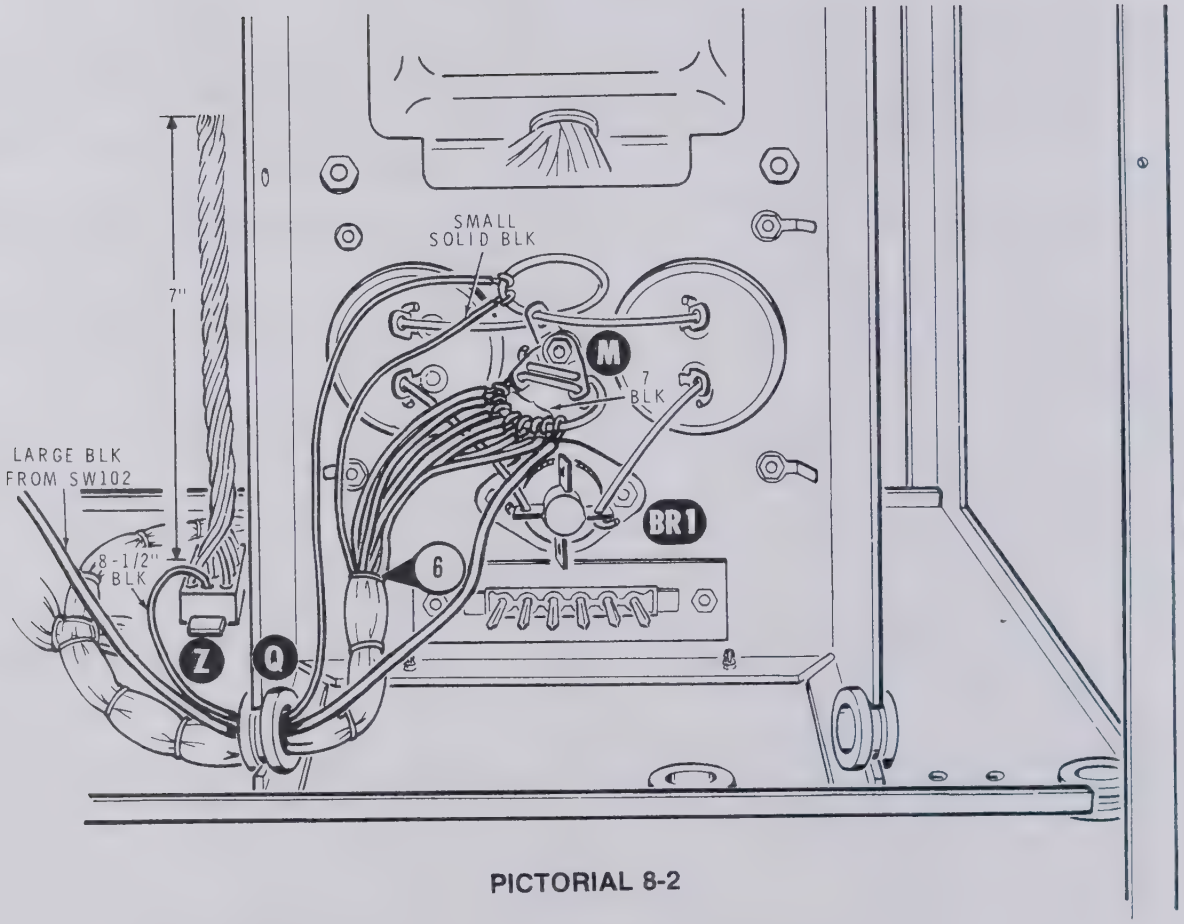
( ) Check the shield leads of the shielded cables to make sure they are not touching any of the socket assembly lugs.

( ) Remove and discard the insulation from a 26" length of black *solid* wire. Then cut the bare wire into eight 3-1/4" lengths.

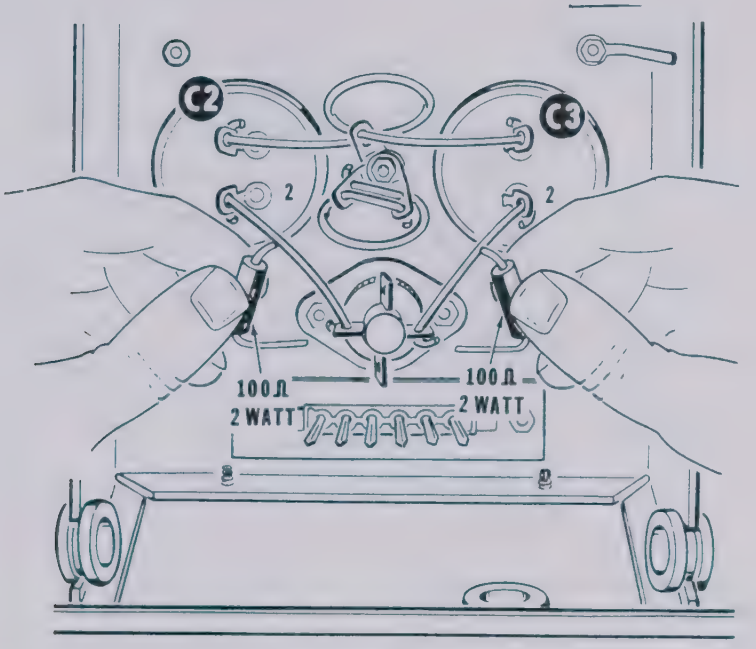
( ) Connect and solder four 3-1/4" bare wires to the four lugs of socket assembly G. Position the wires as shown in Pictorial 8-1.

( ) As before, connect and solder four 3-1/4" bare wires to socket assembly H.

( ) Cut seven of the wires on a taper as shown



PICTORIAL 8-2



Detail 8-2A

Refer to Pictorial 8-2 for the following steps.

( ) Position the Amplifier on its left side panel.

( ) Locate the 100 Ω, 2-watt (brown-black-brown) resistor and cut one lead to 1/4".

NOTE: In the next two steps, perform the steps exactly as stated or a mild electrical shock can result. You are going to discharge the electrical charge stored on the large capacitors.

( ) Refer to Detail 8-2A, hold the resistor by the body, and do not touch either lead. Then touch the long resistor lead to the chassis and the short lead to capacitor C3 lug 2. Hold the resistor here for five seconds. (The resistor may get slightly warm).

( ) Touch the long resistor lead to the chassis and the other lead to capacitor C2 lug 2. Hold the resistor here for five seconds.

( ) Cut the black wire coming from socket Z to 8-1/2". Then route it through grommet Q and connect it to the indicated bare wire loop at M (S-1).

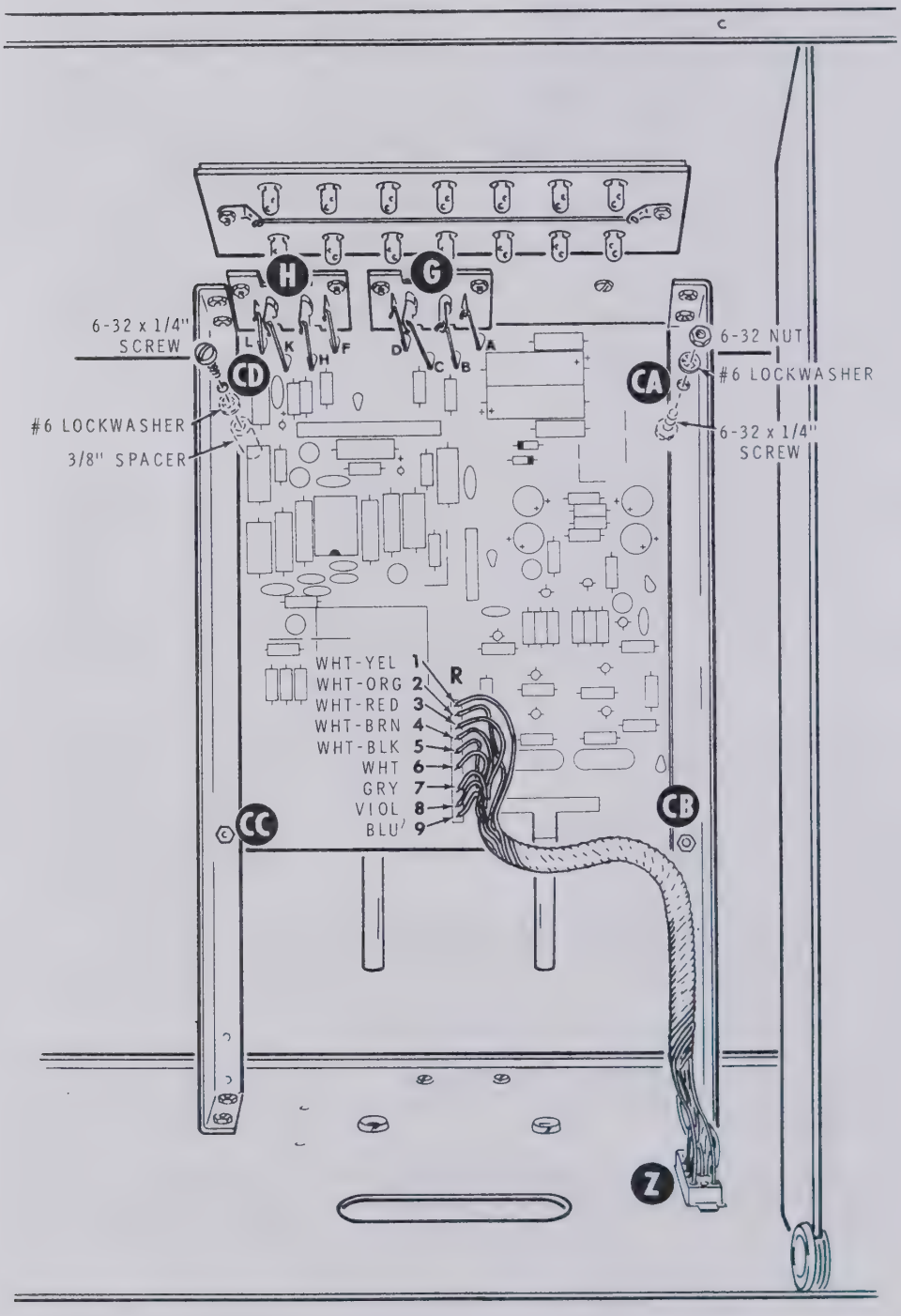
( ) Cut the remaining unconnected wires coming from socket Z to 7" and remove 1/4" of insulation from the ends.

( ) Twist these wires coming from socket Z into a group.

( ) Route wire harness BO #6 through grommet Q.

( ) Connect the small solid black wire from BO #6 to the indicated bare wire loop at M (S-1) and the other black wires to the other bare wire loop (S-7). Be sure to position the wires away from rectifier BR1 exactly as shown.

( ) Route the large black wire coming from switch SW102 of the preamplifier circuit board through grommet Q and connect it to loop M (S-1).



PICTORIAL 8-3

Refer to Pictorial 8-3 for the following steps.

( ) Start the eight bare wires connected to sockets G and H into corresponding holes A, B, C, D, F, H, K, and L in the preamplifier circuit board as shown. Then mount the preamplifier circuit board to the circuit board rails. Use three 6-32 x 1/4" screws, three #6 lockwashers, and three 6-32 nuts at CA,CB, and CC. Use a 6-32 x 1/4" screw, a #6 lockwasher, and a 3/8" spacer at CD as shown.

( ) Solder the eight bare wires to the foil side of the circuit board and cut off the excess wire lengths. Be sure none of the wires touch nearby screws or nuts. (NOTE: It will be easier to solder the connections if you lay the chassis down and then solder the wires).

The preamplifier circuit board has a row of 9 boxed-in holes labeled R. In the following steps, connect the wires coming from socket Z to holes R1 through R9.

( ) Blue to hole R9 (S-1).

( ) Violet to hole R8 (S-1).

( ) Gray to hole R7 (S-1).

( ) White to hole R6 (S-1).

( ) White-black to hole R5 (S-1).

( ) White-brown to hole R4 (S-1).

( ) White-red to hole R3 (S-1).

( ) White-orange to hole R2 (S-1).

( ) White-yellow to hole R1 (S-1).

( ) Cut off the excess wire length on the foil side of the circuit board.

Refer to Pictorial 8-4 (in the "Illustration Booklet") for the following steps. Connect the free ends of the shielded cables coming from socket assembly J to the 6 boxed-in holes labeled P on the preamplifier circuit board as follows:

( ) Cable coming from lug 12 to hole P1 (S-1).

( ) Cable coming from lug 13 to hole P2 (S-1).

( ) Cable coming from lug 14 to hole P3 (S-1).

( ) Cable coming from lug 5 to hole P4 (S-1).

( ) Cable coming from lug 6 to hole P5 (S-1).

( ) Cable coming from lug 7 to hole P6 (S-1).

( ) Connect the remaining black wire coming from wiring harness BO #1 to switch SW101 lug 2 (S-1). Be careful you do not burn any nearby wires or cables.

Connect the following wiring harness cables and wires to the preamplifier circuit board as follows:

BO #2

Gray-marked cable:

( ) Inner lead to hole L IN (S-1).

( ) Shield lead to hole S (S-1).

Green-marked cable:

( ) Inner lead to hole M (S-1).

( ) Shield lead to hole S (S-1).

White-marked cable:

( ) Inner lead to hole N (S-1).

( ) Shield lead to hole S (S-1).

Blue-marked cable:

( ) Inner lead to hole L OUT (S-1).

( ) Shield lead to hole S (S-1).

BO #3

Yellow-marked cable:

( ) Inner lead to hole R IN (S-1).

( ) Shield lead to hole S (S-1).

White-marked cable:

( ) Inner lead to hole R OUT (S-1).

( ) Shield lead to hole S (S-1).

BO #4

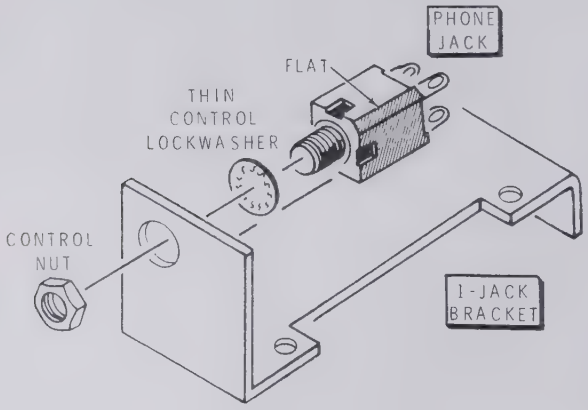
( ) White wire to hole —32V (S-1).

( ) Either black wire to hole G (S-1).

( ) Red wire to hole +32V (S-1).

( ) Other black wire to either hole GND (S-1).

( ) Connect the black wire coming from socket assembly J to the other circuit board hole GND (S-1).



Detail 9-1A

Refer to Pictorial 9-1 (in the "Illustration Booklet") for the following steps.

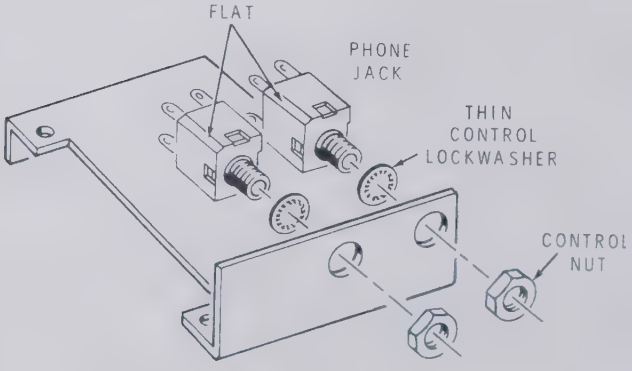
( ) Set the Amplifier aside temporarily.

( ) Refer to Detail 9-1A and mount a phone jack on the 1-jack bracket. Use a thin control lockwasher and a control nut, and be sure to position the jack so the flat is as shown.

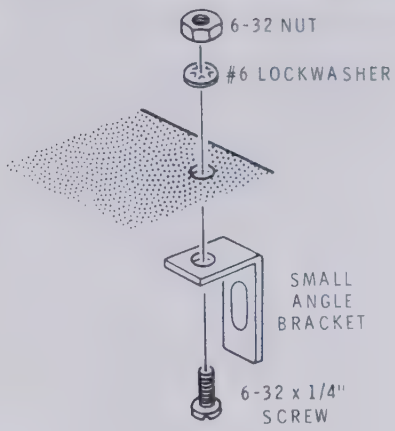
( ) In a similar manner, refer to Detail 9-1B and mount two phone jacks on the 2-jack bracket. Position the flats as shown.

( ) *Loosely* mount the 2-jack bracket *under* the right end of the tone circuit board. Use two 6-32 x 1/4" screws, two #6 lockwashers, and two 6-32 nuts. These screws will be tightened later.

( ) *Loosely* mount the 1-jack bracket *under* the left end of the circuit board. Use one 6-32 × 1/4" screw, one #6 solder lug, one 6-32 nut, and one #4 × 5/16" self-tapping screw as shown.



Detail 9-1B



Detail 9-1C

( ) Refer to Detail 9-1C and *loosely* mount a small angle bracket to the circuit board at DD. Position the long side as shown. Use a 6-32 x 1/4" screw, a #6 lockwasher, and a 6-32 nut.

( ) Cut a 5-1/2" black *solid* wire. Remove 1/4" of insulation from one end and 1-1/8" of insulation from the other end.

( ) Route the long bare end through jack DA lug 1 (NS) to jack DB lug 1 (NS).

Connect cables coming from the circuit board to the jacks as follows:

Cable coming from hole R3 to jack DA:

( ) Inner lead to lug 3 (S-1).

( ) Shield lead to lug 1 (NS).

Cable coming from hole R5 to jack DA:

( ) Inner lead to lug 2 (S-1).

( ) Shield lead to lug 1 (S-4).

Cable coming from hole R1 to jack DB:

( ) Inner lead to lug 3 (S-1).

( ) Shield lead to lug 1 (NS).

Cable coming from hole R6 to jack DB:

( ) Inner lead to lug 2 (S-1).

( ) Shield lead to lug 1 (S-3).

( ) Check the bare wire between lug 1 of jack DA and lug 1 of jack DB to be sure it does not touch another nearby lug.

( ) Prepare the following *solid* wires:

LENGTH	WIRE
2"	Black
2-1/2"	Blue
3"	Brown

( ) Connect the black wire from jack DC lug 1 (S-1) to the indicated solder lug (S-1).

( ) Connect the blue wire from jack DC lug 2 (S-1) to hole L HP (S-1).

( ) Connect the brown wire from jack DC lug 3 (S-1) to hole R HP (S-1).

( ) Refer to Detail 9-1D (in the "Illustration Booklet") and position the Amplifier on its left side panel.

( ) *Loosely* mount the tone circuit board to the front subpanel. Use five 6-32 x 3/8" black screws, five #6 lockwashers, three #8 long solder lugs, and five 6-32 nuts at the positions shown in the Pictorial.

( ) Refer to the inset drawing and route the wires coming from grommet X around the end of the tone circuit board as shown. Then bend the long solder lug around the wires to hold them in place.

Connect the wires and cables coming from wire harness BO #9 to the tone circuit board as follows:

WIRES

( ) Long red to hole +V (S-1).

( ) Long black to hole GND (S-1).

( ) Short red to hole +32V (S-1).

( ) White to hole —32V (S-1).

( ) Remaining black to hole G (S-1).

CABLES (See the inset drawing.)

Yellow:

( ) Inner lead to hole F (S-1).

( ) Shield lead to indicated hole S (S-1).

Blue:

( ) Inner lead to hole E (S-1).

( ) Shield lead to indicated hole S (S-1).

Red:

( ) Inner lead to hole K (S-1).

( ) Shield lead to indicated hole S (S-1).

Green:

( ) Inner lead to hole H (S-1).

( ) Shield lead to indicated hole S (S-1).

Brown:

( ) Inner lead to hole L (S-1).

( ) Shield lead to indicated hole S (S-1).

White:

( ) Inner lead to hole M (S-1).

( ) Shield lead to indicated hole S (S-1).

Connect the cables coming from BO #7 as follows:

White:

( ) Inner lead to hole R IN (S-1).

( ) Shield lead to indicated hole S (S-1).

Blue:

( ) Inner lead to hole L IN (S-1).

( ) Shield lead to indicated hole S (S-1).

Connect the shielded cables coming from BO #8 as follows:

( ) Black (unmarked) to hole P1 (S-1).

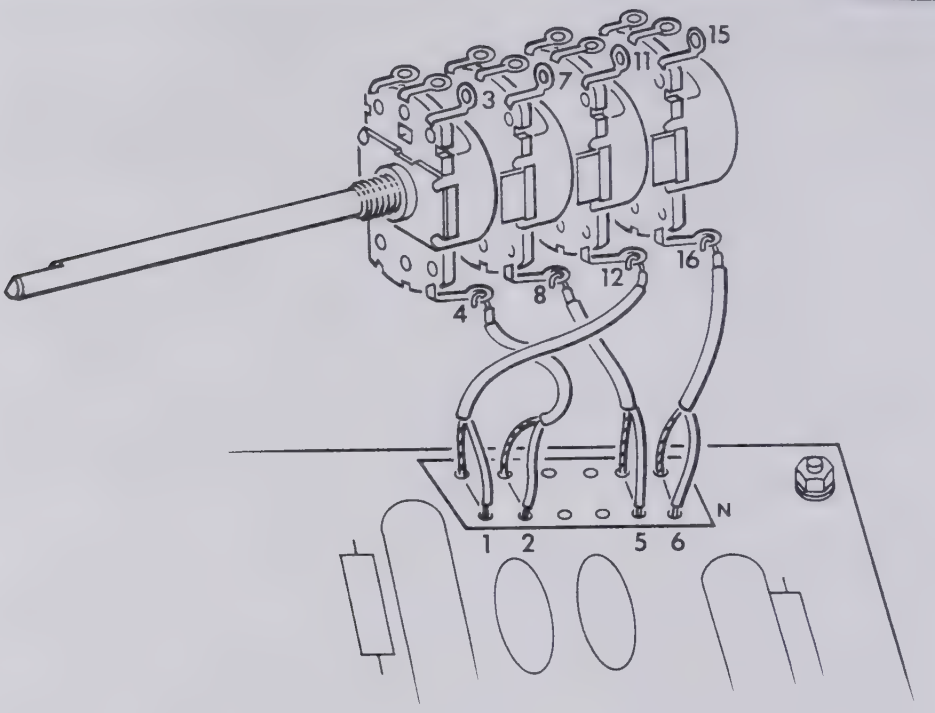
( ) Brown to hole P2 (S-1).

( ) Green to hole P3 (S-1).

( ) White to hole P4 (S-1).

( ) Red to hole P5 (S-1).

( ) Orange to hole P6 (S-1).



PICTORIAL 9-2

Refer to Pictorial 9-2 for the following steps.

Connect the cables coming from the tone circuit board to 100 kΩ/25 kΩ multiple control R4 as follows:

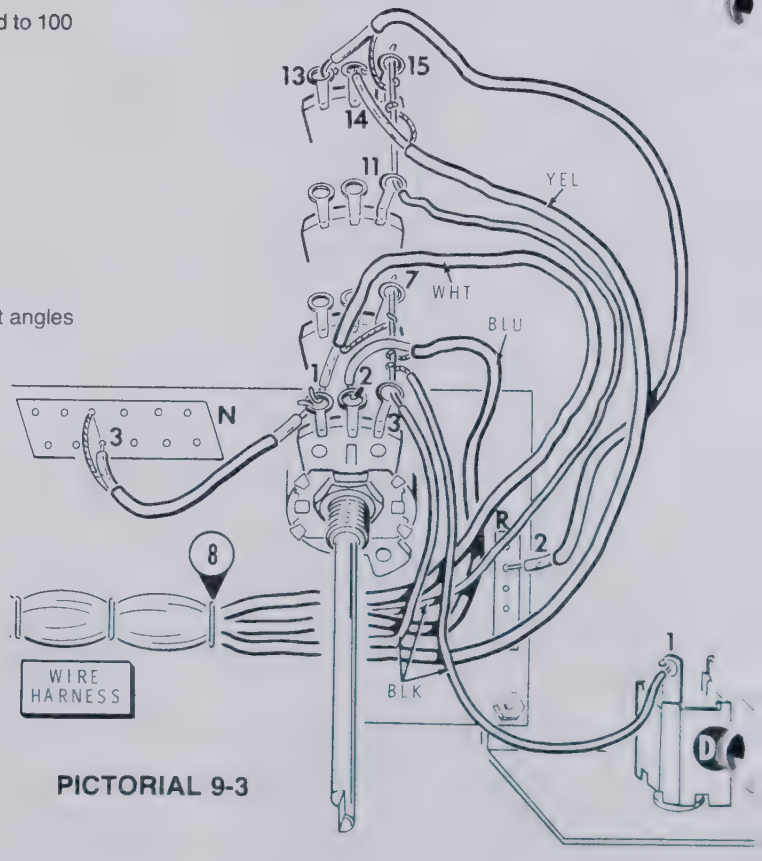
( ) Cable from hole N2 to lug 4 (S-1).

( ) Cable from hole N5 to lug 8 (S-1).

( ) Cable from hole N1 to lug 12 (S-1).

( ) Cable from hole N6 to lug 16 (S-1).

( ) Bend lugs 3, 7, 11, and 15 of the control at right angles as shown.



PICTORIAL 9-3

Refer to Pictorial 9-3 for the following steps.

( ) Remove an additional 1/4" of insulation from the two black stranded wires coming from wire harness BO #8.

( ) Route the wires around the control as shown.

( ) Route either black wire through lug 3 (S-2) to lug 7 (S-1).

( ) Route the other black wire through lug 11 (S-2) to lug 15 (S-1).

NOTE: In the following steps, you will connect cable shield leads to the bare lengths of wire between lugs 3 and 7, and 11 and 15. Route all cables and wires as shown.

Yellow-marked cable coming from BO #8:

( ) Inner lead to lug 14 (S-1).

( ) Shield lead to indicated bare wire (S-1).

Cable coming from circuit board hole R2:

( ) Inner lead to lug 13 (S-1).

( ) Shield lead to indicated bare wire (S-1).

Blue-marked cable coming from BO#8:

( ) Inner lead to lug 2 (S-1).

( ) Shield lead to indicated bare wire (S-1).

White-marked cable coming from BO #8:

( ) Inner lead to lug 1 (NS).

( ) Shield lead to indicated bare wire (S-1).

Cable coming from circuit board hole N3:

( ) Inner lead to lug 1 (S-2).

( ) Connect the black wire coming from phone jack DA lug 1 to the indicated bare wire (S-1).

Refer to Pictorial 9-4 for the following steps.

Gray-marked cable coming from BO #8:

( ) Inner lead to lug 10 (S-1).

( ) Shield lead to indicated bare wire (S-1).

Cable coming from circuit board hole R4:

( ) Inner lead to lug 9 (S-1).

( ) Shield lead to indicated bare wire (S-1).

Red-marked cable coming from BO #8:

( ) Inner lead to lug 6 (S-1).

( ) Shield lead to indicated bare wire (S-1).

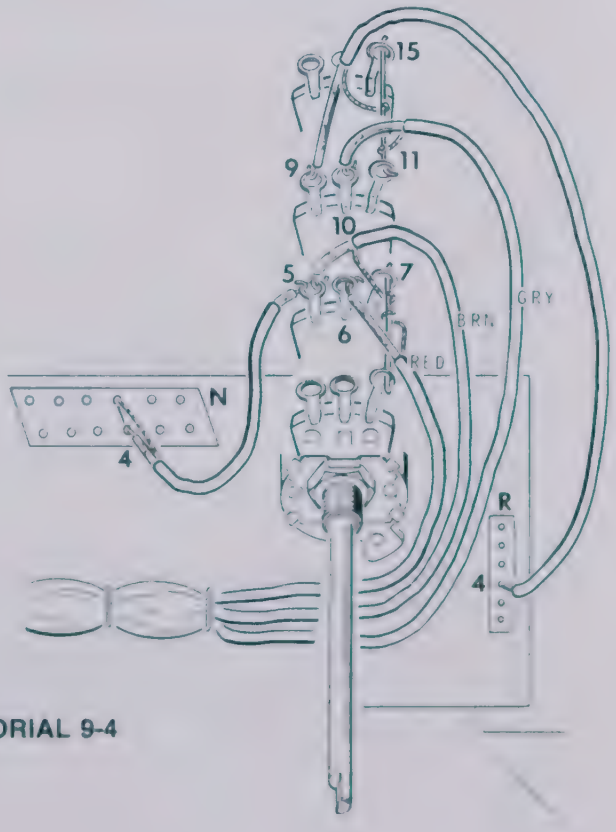
Brown-marked cable coming from BO #8:

( ) Inner lead to lug 5 (NS).

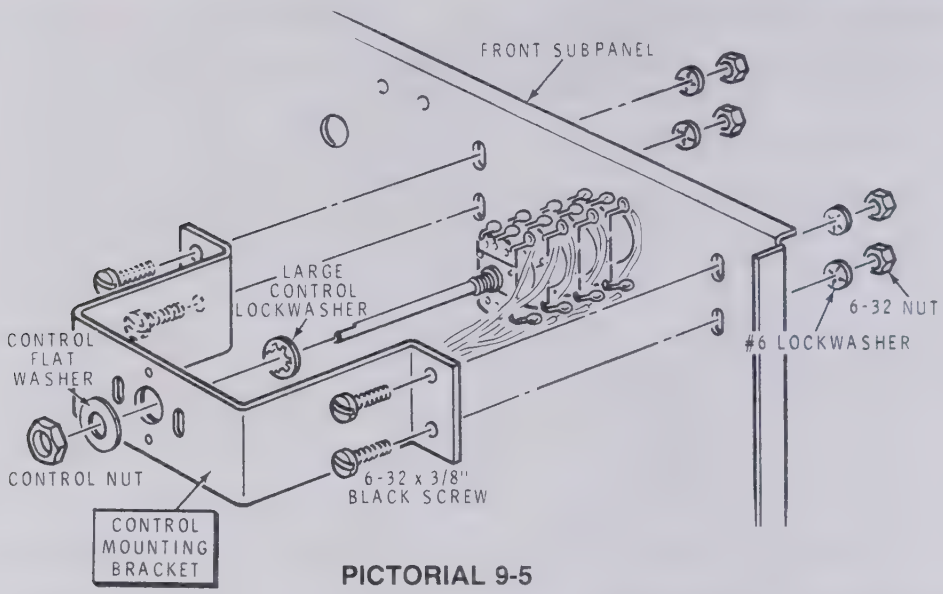
( ) Shield lead to indicated bare wire (S-1).

Cable coming from circuit board hole N4:

( ) Inner lead to lug 5 (S-2).



PICTORIAL 9-4



PICTORIAL 9-5

Refer to Pictorial 9-5 for the following steps.

( ) R4: Loosely mount the multiple control to the control mounting bracket with a control lockwasher, a control flat washer, and a control nut. The control nut will be tightened later. (NOTE: If the control already has hardware on it, remove and discard this hardware.)

( ) Mount the control mounting bracket to the front subpanel as shown. Use four 6-32 × 3/8" black screws, four #6 lockwashers, and four 6-32 nuts.

Refer to Pictorial 9-6 for the following steps.

Connect four wires coming from grommet X to the tone circuit board as follows:

( ) Gray to hole B (S-1). If this wire (and the following wires) seems too short, check where the other end is connected and route the slack through the chassis.

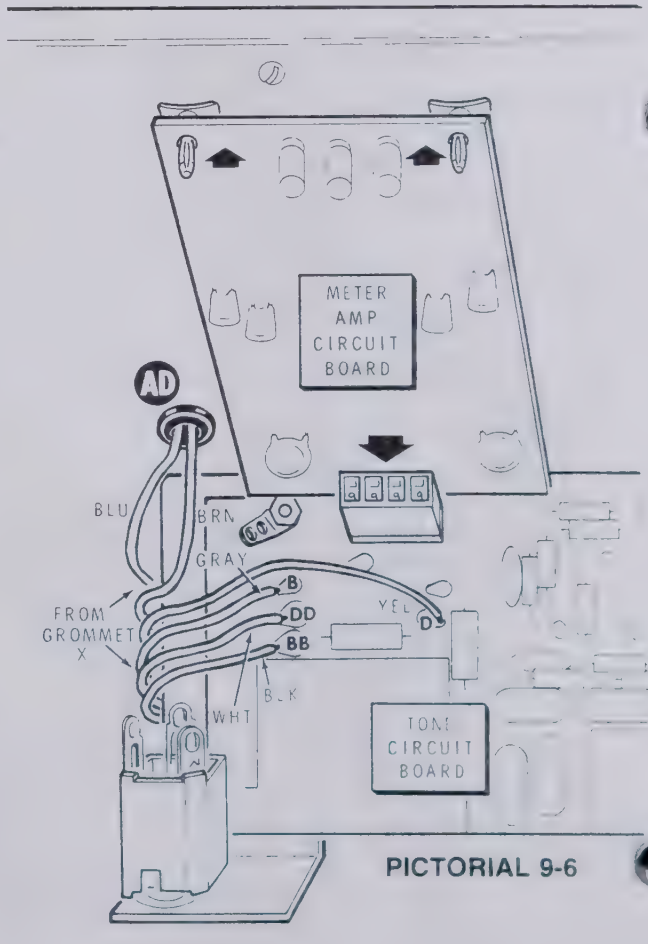
( ) Yellow to hole D (S-1).

( ) White to hole DD (S-1).

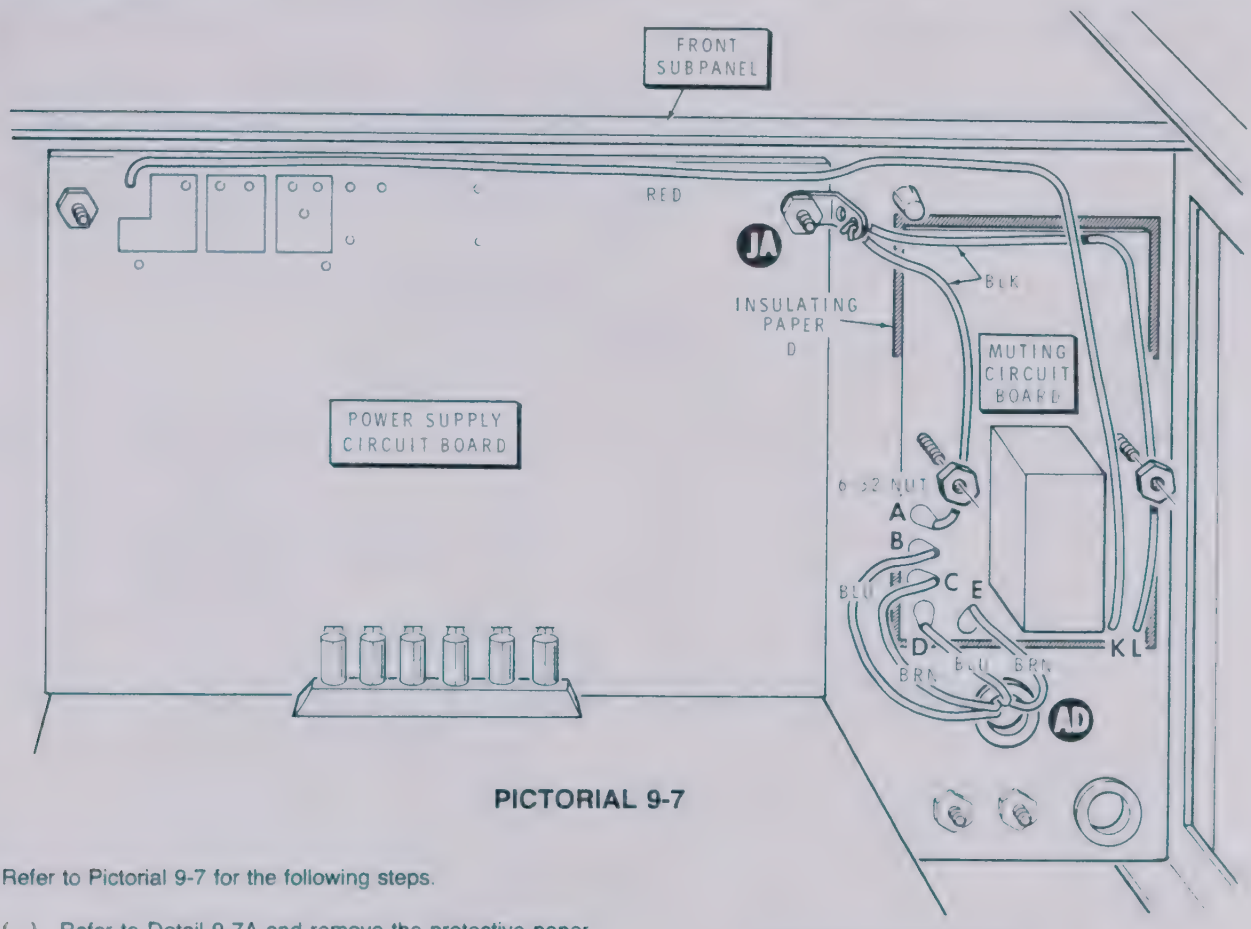
( ) Black to hole BB (S-1).

( ) Route the blue and brown wires coming from grommet X through grommet AD.

( ) Plug the meter amplifier circuit board into the tone circuit board. Then secure the meter amplifier circuit board in place by pushing it onto the two circuit board standoffs until the standoffs latch in place.



PICTORIAL 9-6



PICTORIAL 9-7

Refer to Pictorial 9-7 for the following steps.

( ) Refer to Detail 9-7A and remove the protective paper backing from the piece of insulating paper marked D. Then press the paper in place on the back of the front subpanel (between the two screws) as shown.

Connect the two wires coming from grommet AD to the muting circuit board as follows:

( ) Brown wire to hole C (S-1).

( ) Blue wire to hole B (S-1).

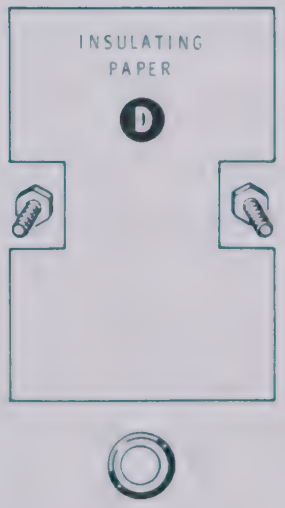
( ) Route the free ends of the other blue and brown wires (coming from the muting circuit board holes D and E) through grommet AD.

( ) Mount the muting circuit board to the front subpanel with two 6-32 nuts as shown

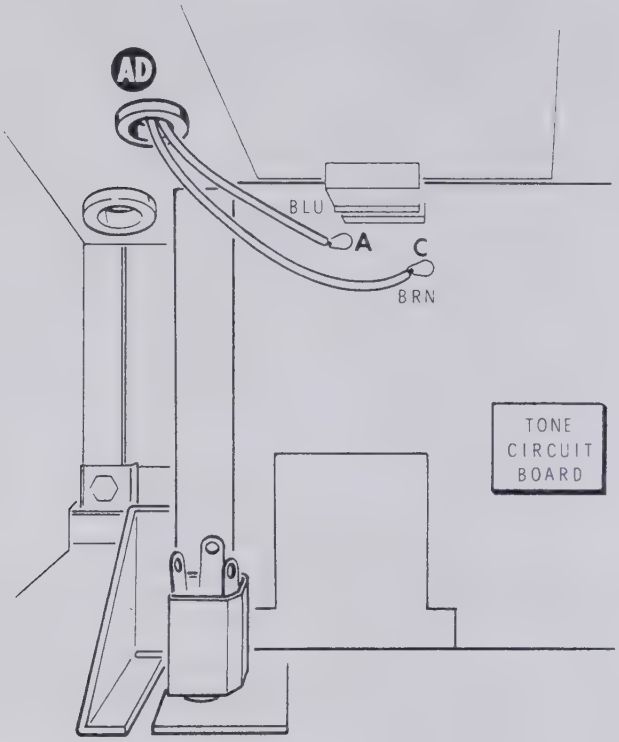
Connect the remaining wires coming from the muting circuit board to the power supply circuit board as follows:

( ) Two black wires (coming from holes A and L) to solder lug JA (S-2)

( ) Red wire (coming from hole K) to the indicated unmarked hole (S-1). Temporarily remove the power supply circuit board if necessary



Detail 9-7A



PICTORIAL 9-8

Refer to Pictorial 9-8 for the following steps.

Connect the remaining two wires coming from grommet AD to the tone circuit board as follows:

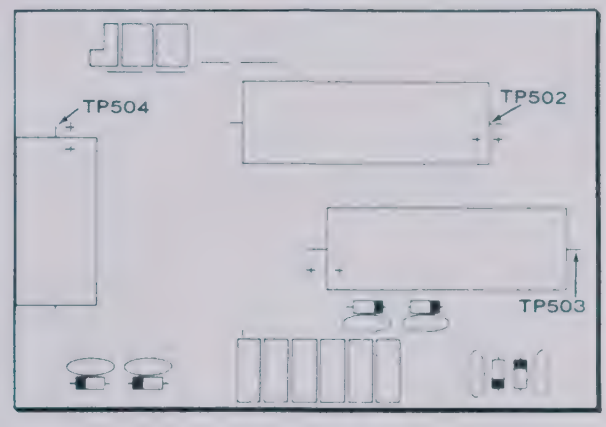
( ) Blue wire to hole A (S-1).

( ) Brown wire to hole C (S-1).

VOLTAGE TESTS

If you do not obtain the indicated meter reading in a step, check the device or devices in the block marked "Incorrect Reading, Check." If you need further help to locate the trouble, refer to the "In Case of Difficulty" section on Page 109. Locate and repair any trouble before you proceed to another test. Refer to "Checking Components" on Page 114 to identify the defective components.

( ) Position the FUNCTION switch to NORM/V.

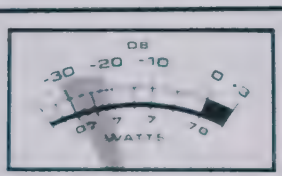


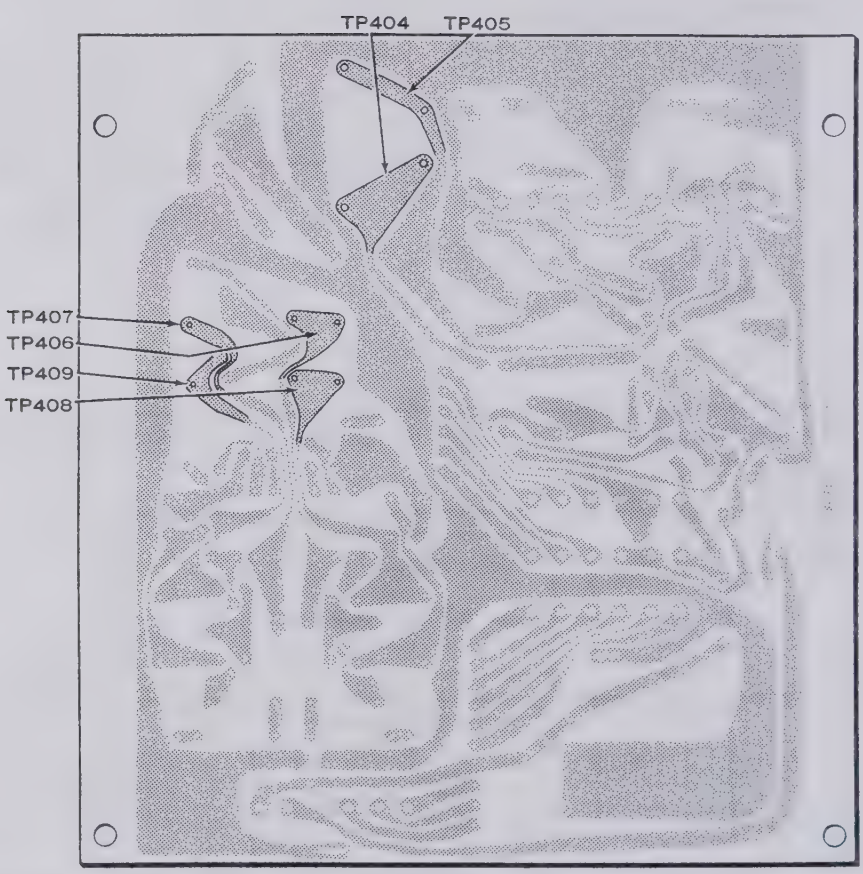
PICTORIAL 10-1

Power Supply Circuit Board

Refer to Pictorial 10-1 for the following steps.

( ) Plug in the line cord.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK
	BLACK TO:	RED TO:		
( )	Chassis	TP502		1. D501 2. D502 3. D503 4. D504 5. C505 6. +32 volt supply
( )	Chassis	TP504		1. D505 2. D506 3. C509
( )	TP503	Chassis		1 D501 2. D502 3. D503 4. D504 5. C506 6. −32 volt supply

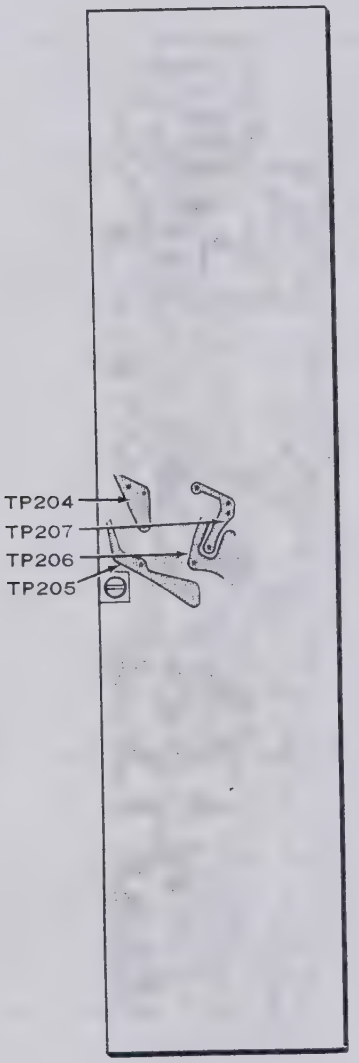


PICTORIAL 10-2

Preamp Circuit Board

Refer to Pictorial 10-2 for the following tests. Make the tests on the foil side of the circuit board.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK
	BLACK TO:	RED TO:		
( )	Chassis	TP404		1. ZD101 2. C111 3. IC101 4. R116
( )	Chassis	TP406		1. Q101, Q102 2. C125 3. R136 4. Solder bridges
( )	Chassis	TP407		1. Q105, Q106 2. C132 3. R148 4. Solder bridges
( )	TP405	Chassis		1. ZD102 2. C113 3. IC101 4. R117
( )	TP408	Chassis		1. Q101, Q102 2. C127 3. R137 4. Solder bridges
( )	TP409	Chassis		1. Q105, Q106 2. C131 3. R149 4. Solder bridges

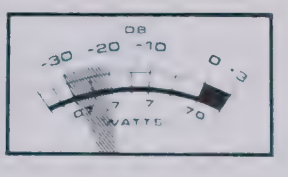


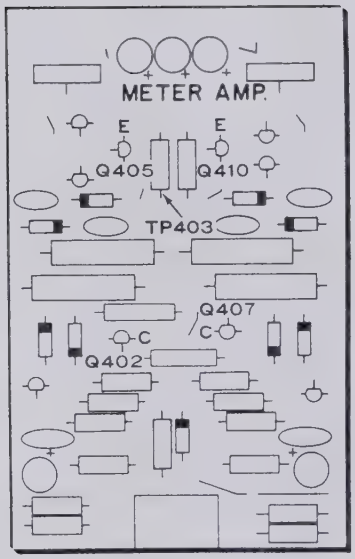
PICTORIAL 10-3

Tone Circuit Board

( ) Position the Amplifier on its left side panel.

Refer to Pictorial 10-3 for the following tests. Make the tests on the foil side of the circuit board.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK
	BLACK TO:	RED TO:		
( )	Chassis	TP204		1. Q201, Q202, Q203, Q204, Q205, Q206, Q207. 2. C207 3. R213 4. Solder bridges
( )	Chassis	TP205		1. Q208, Q209, Q210, Q211, Q212, Q213, Q214 2. C226 3. R245 4. Solder bridges
( )	TP206	Chassis		1. Q201, Q202, Q203, Q204, Q205, Q206, Q207. 2. C208 3. R212 4. Solder bridges
( )	TP207	Chassis		1. Q208, Q209, Q210, Q211, Q212, Q213, Q214 2. C227 3. R244 4. Solder bridges



PICTORIAL 10-4

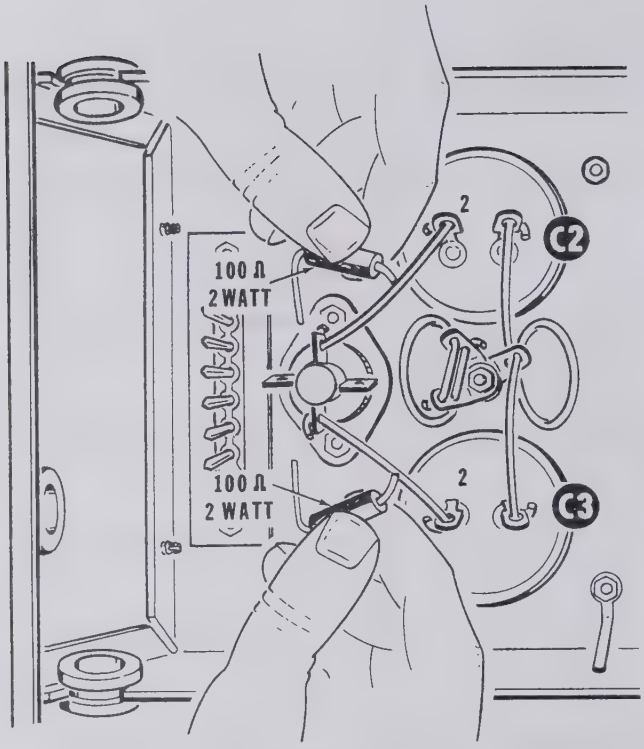
Meter Amplifier Circuit Board

( ) Position the Amplifier down on its bottom.

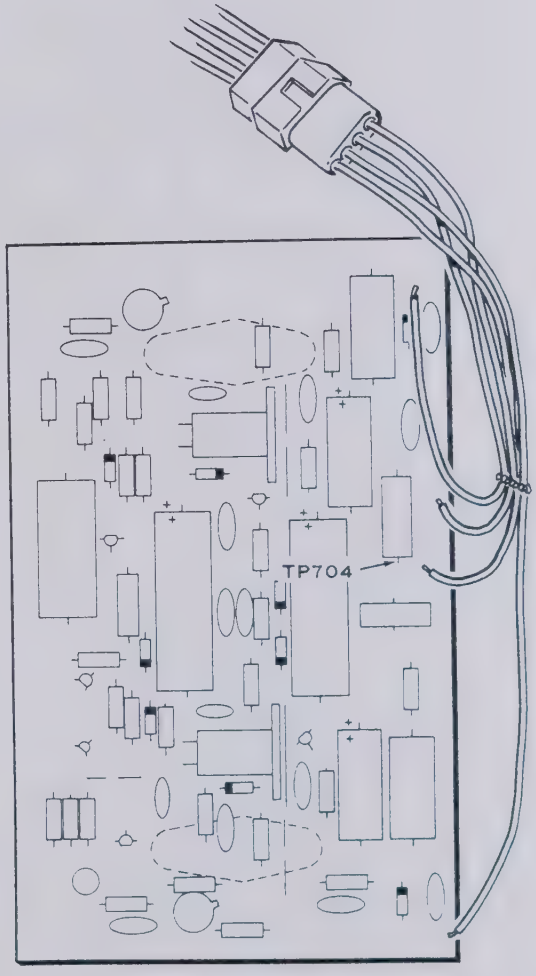
Refer to Pictorial 10-4 for the following tests.

	CONNECT TEST LEADS		METER INDICATION	INCORRECT READING, CHECK
	BLACK TO:	RED TO:		
( )	Chassis	TP403		1. ZD407 2. C406 3. R408 4. Solder bridges
( )	Chassis	C of Q402		1. Q401 2. Q402
( )	Chassis	C of Q407		1. Q406. 2. Q407
( )	Chassis	E of Q405		1. Q405 2. C405
( )	Chassis	E of Q410		1. Q410 2. C412

( ) Unplug the line cord.



PICTORIAL 10-5



PICTORIAL 10-6

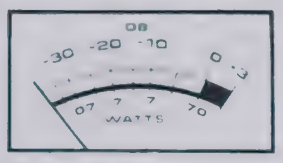
( ) Position the chassis on its left side panel, refer to Pictorial 10-5, and again use the 100 Ω, 2-watt (brown-black-brown) resistor to discharge capacitors C2 and C3. Hold the resistor between the chassis and lug 2 of each capacitor for five seconds. Do not touch either lead of the resistor.

Output Amplifier Circuit Board

Refer to Pictorial 10-6 for the following tests.

( ) Plug in an output amplifier to either plug in the chassis as shown. Do not let any transistors touch the chassis; especially the ones mounted on the large heat sink.

( ) Plug in the line cord.

	CONNECT TEST LEADS		METER	INCORRECT READING,
	BLACK TO:	RED TO:	INDICATION	CHECK
( ) ( )	Chassis	TP704		1. All transistors 2. D702

( ) Unplug the line cord and wait 30 seconds before you perform the next step.

( ) Unplug the power amplifier and then plug in the remaining power amplifier.

( ) Plug in the line cord and perform the previous test on this power amplifier.

( ) Unplug the line cord and wait 30 seconds before you perform the next step.

( ) Unplug the power amplifier and set it aside.

( ) Fold up the test leads and insert them into the plastic clamp. Clip the clips to the wires so they cannot fall out of the clamp.

( ) Cut off the two *meter* wires as close to the *switch* lugs as possible. Then remove 1/4" of insulation from the wire ends. Do not remove the wires from the meter.

( ) Position the METER switch to its NORM position.

OUTPUT AMPLIFIER INSTALLATION

Refer to Pictorial 11-1 (in the "Illustration Booklet") for the following steps.

( ) Position the Amplifier on its left side panel.

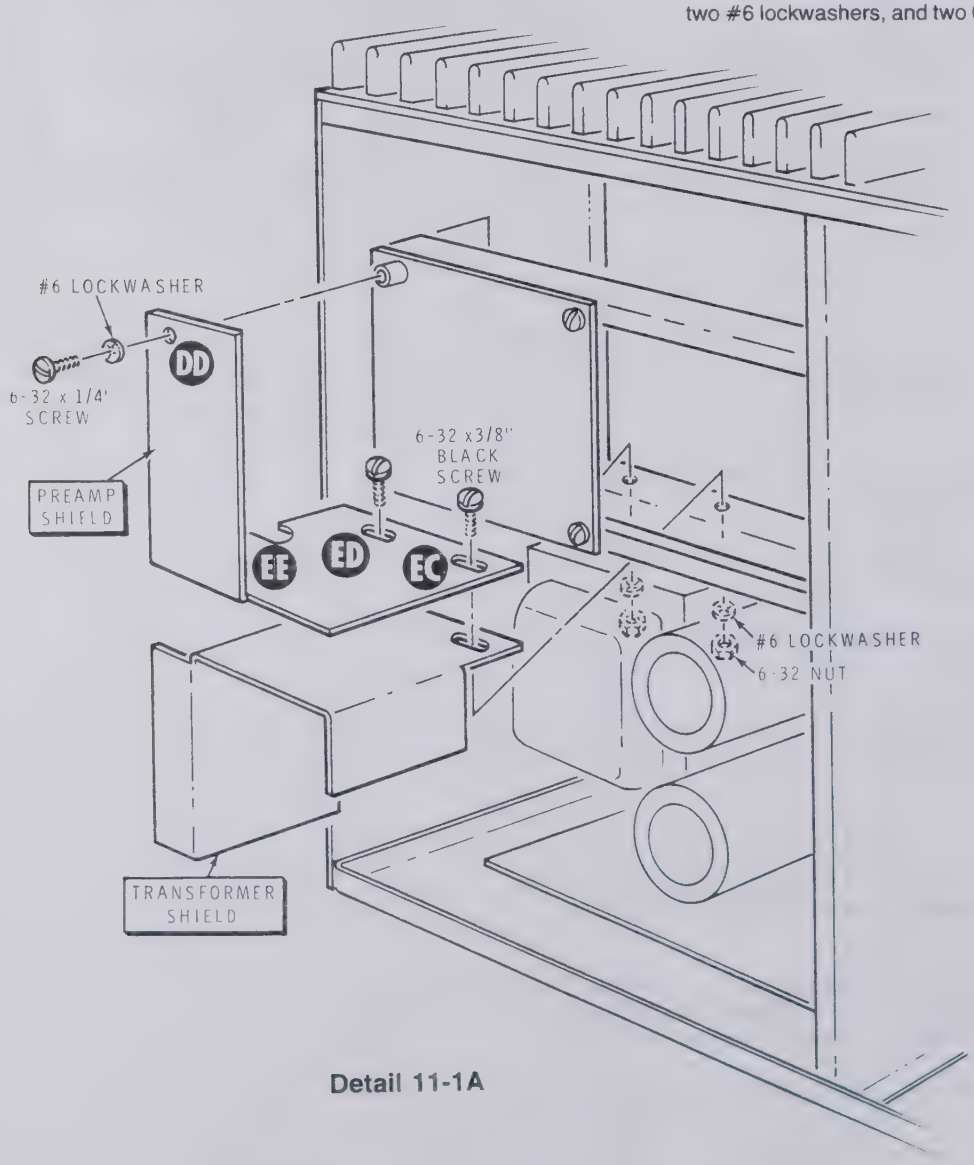
( ) Mount an output amplifier to the right side panel as shown. Use six 6-32 × 3/8" black screws. Note that the phono socket is towards the rear of the chassis.

( ) Plug the phono cable coming from lug 8 of phono socket assembly J into the output amplifier circuit board.

( ) Plug together the 4-connector plug and socket, and secure the wires to the front subpanel with the two long solder lugs at EA and EB as shown.

NOTE: In the next step, be sure the phono cable routed behind the transformer fits in opening EE of the preamplifier shield and no wires are pinched between the shields and chassis

( ) Refer to Detail 11-1A and install the transformer shield and the preamplifier shield. Use a 6-32 x 1/4" screw and #6 lockwasher at DD, and two 6-32 x 3/8" black screws, two #6 lockwashers, and two 6-32 nuts at EC and ED.



Detail 11-1A

Refer to Pictorial 11-2 for the following steps.

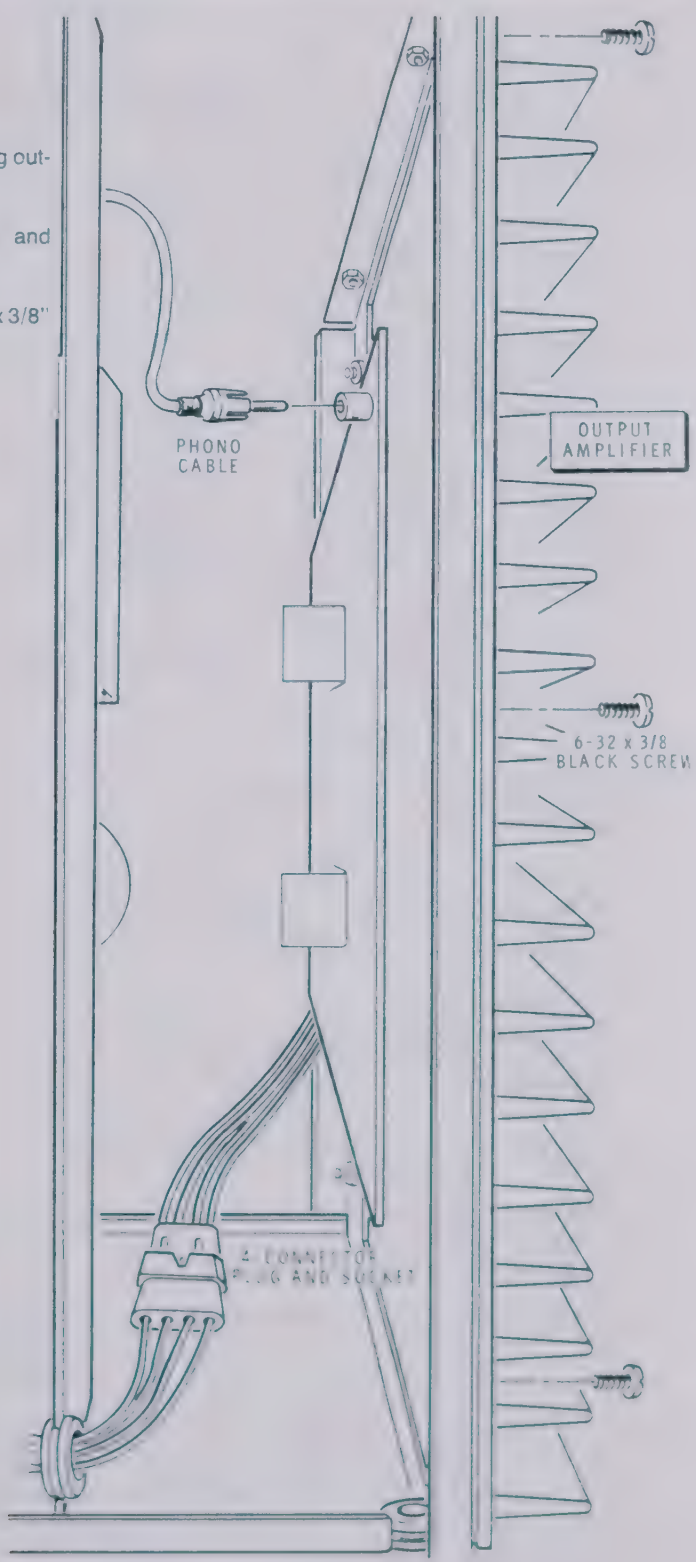
( ) Position the chassis on its right side.

( ) Plug the remaining phono cable into the remaining output amplifier.

( ) As before, plug together the 4-connector plug and socket.

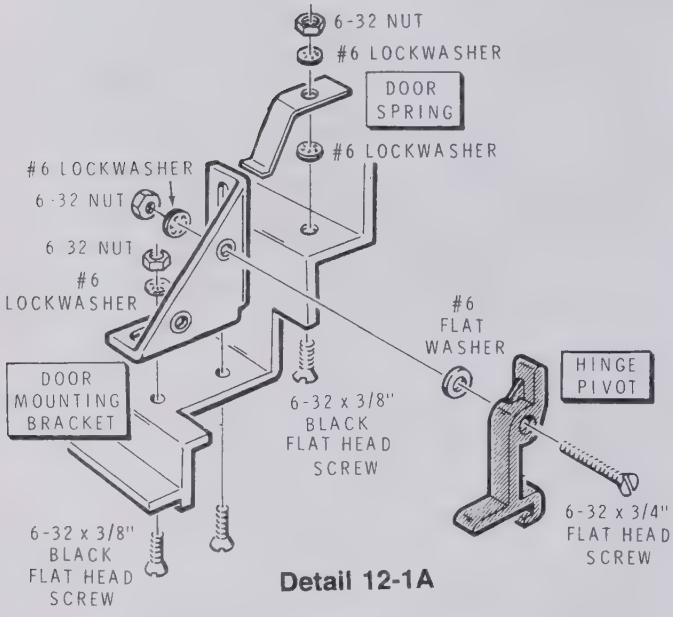
( ) Mount the amplifier to the side panel with six 6-32 x 3/8" black screws.

( ) Set the chassis aside temporarily.



PICTORIAL 11-2

FRONT PANEL ASSEMBLY



Detail 12-1A

Refer to Pictorial 12-1 (in the "Illustration Booklet") for the following steps.

( ) Position the front panel on a soft cloth on your work surface as shown.

( ) From the front of the front panel, install nylon bearings at S2, S1, and R4.

( ) Push a #6 thick push-on nut onto the front panel at hole FC. Be sure the flat side is down as shown in inset drawing #1.

( ) As before, install #6 thick push-on nuts at holes FD and FE.

( ) Refer to Detail 12-1A and mount a door mounting bracket at FA. Use two 6-32 x 3/8" black flat head screws, two #6 lockwashers, and two 6-32 nuts.

( ) Mount a door spring to the front panel. Use a 6-32 × 3/8" black flat head screw, two #6 lockwashers, and a 6-32 nut as shown.

( ) Mount a hinge pivot with a 6-32 × 3/4" flat head screw and #6 flat washer as shown. Tighten the screw so it is just snug. Then back it out 1/2 turn. Operate the pivot. and readjust the door spring as necessary. so the pivot can operate as shown in inset drawing #2 in Pictorial 12-1.

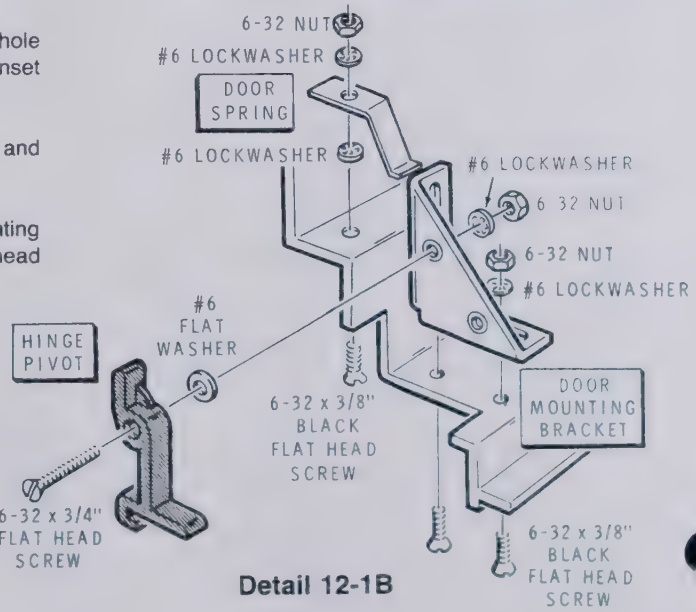
( ) Install a #6 lockwasher and a 6-32 nut onto the hinge pivot screw. Make sure the screw does not turn. Hold the screw with a screwdriver while you tighten the nut.

( ) Refer to Detail 12-1B and mount a door mounting bracket at FB. Use two 6-32 × 3/8" black flat head screws, two #6 lockwashers, and two 6-32 nuts.

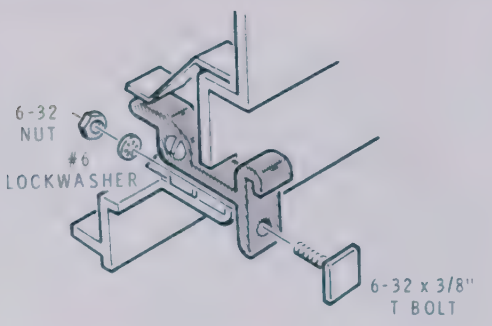
( ) Mount a door spring to the front panel. Use a 6-32 × 3/8" black flat head screw, two #6 lockwashers, and a 6-32 nut as shown.

( ) Mount a hinge pivot with a 6-32 × 3/4" flat head screw and #6 flat washer, as shown. Tighten the screw so it is just snug. Then back it out 1/2 turn. Operate the pivot, and readjust the door spring as necessary, so the pivot can operate as before.

( ) Install a #6 lockwasher and a 6-32 nut onto the hinge pivot screw. Make sure the screw does not turn. Hold the screw with a screwdriver while you tighten the nut.



Detail 12-1B

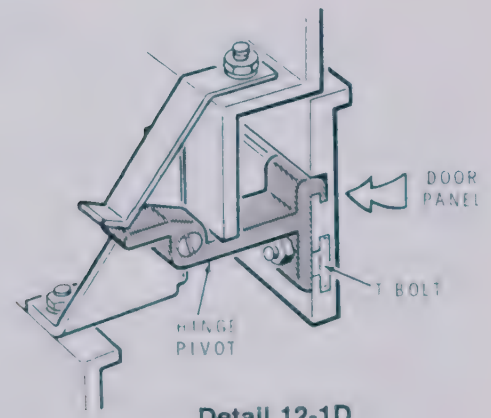


Detail 12-1C

( ) Refer to Detail 12-1C and loosely mount a 6-32 x 3/8" T bolt in each hinge pivot as shown. Use #6 lockwashers and 6-32 nuts.

( ) Refer to Detail 12-1D and slide the door panel onto the two hinge pivots and T bolts. Center the door panel and then tighten the nuts on the T bolts.

( ) Operate the door panel and make any mechanical adjustments necessary for a smooth action and proper fit.



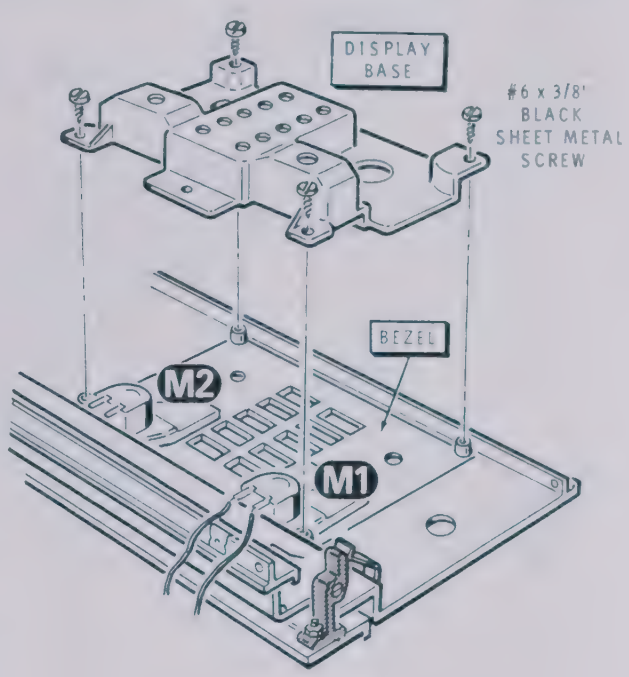
Detail 12-1D

( ) Refer to Detail 12-1E and place the bezel in the front panel as shown.

( ) M1, M2: Remove the two meters from their boxes. Position the meter-with-leads at M1 as shown and the other meter at M2 as shown.

( ) Mount the display base to the bezel with four #6 x 3/8" black sheet metal screws until it is snug. Do not overtighten the screws so the display base bends up.

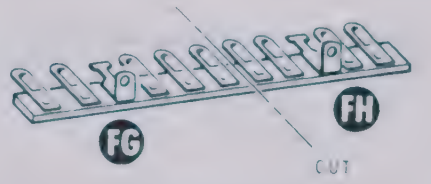
( ) Remove the small wire from between the lugs of meter M2



Detail 12-1E

( ) Refer to Detail 12-1F, position the terminal strip so the mounting lugs are as shown, and cut the terminal strip into two terminal strips as shown (terminal strips FG and FH).

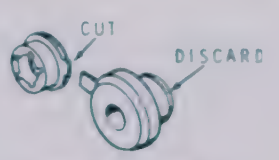
( ) Mount the terminal strips (FG and FH) to the display base with two #4 x 3/16" self-tapping screws.



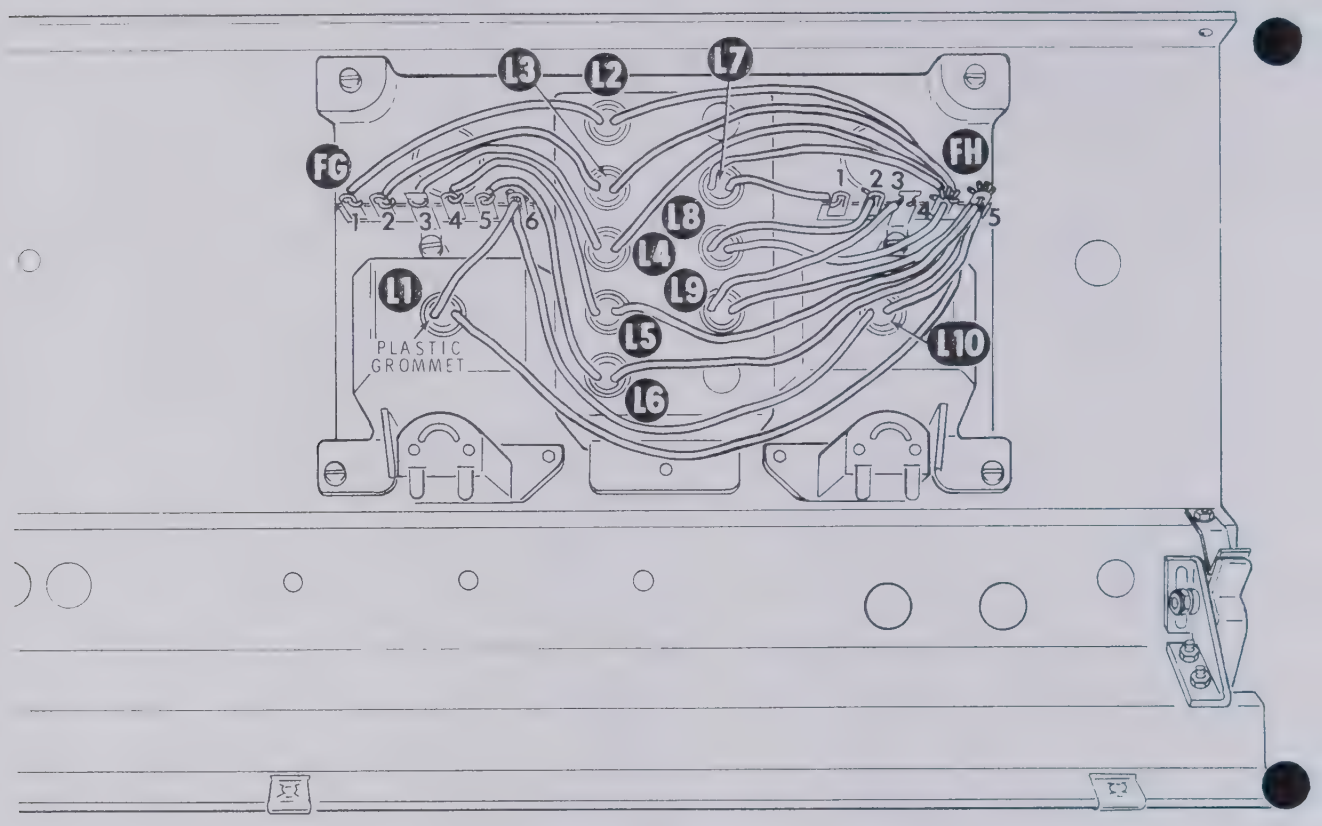
Detail 12-1F

( ) Refer to Detail 12-1G and cut the ten plastic grommets into two pieces as shown. Discard the indicated pieces of the grommets.

( ) Push the remaining pieces of the grommets into holes L1 through L10.



Detail 12-1G



PICTORIAL 12-2

Refer to Pictorial 12-2 for the following steps.

In the following ten steps, you will install the lamps and connect the leads to the terminal strips. Install each lamp as follows:

A. Push it into a plastic grommet.

B. Route the leads to where they connect.

C. Cut the leads a little extra long.

D. Remove 1/4" of insulation from the lead ends.

E. Connect the leads as described in the step.

F. Neatly position the leads down and out of the way.

( ) L1: Lamp from FG lug 6 (NS) to FH lug 5 (NS). Be sure the back end of the lamp is flush with the top of the plastic grommet.

( ) L2: Lamp from FG lug 1 (NS) to FH lug 4 (NS).

( ) L3: Lamp from FG lug 2 (NS) to FH lug 4 (NS).

( ) L4: Lamp from FG lug 3 (NS) to FH lug 4 (NS).

( ) L5: Lamp from FG lug 4 (NS) to FH lug 5 (NS).

( ) L6: Lamp from FG lug 5 (NS) to FH lug 5 (NS).

( ) L7: Lamp between FH lugs 1 (NS) and 4 (NS).

( ) L8: Lamp between FH lugs 2 (NS) and 4 (NS).

( ) L9: Lamp between FH lugs 3 (NS) and 5 (NS).

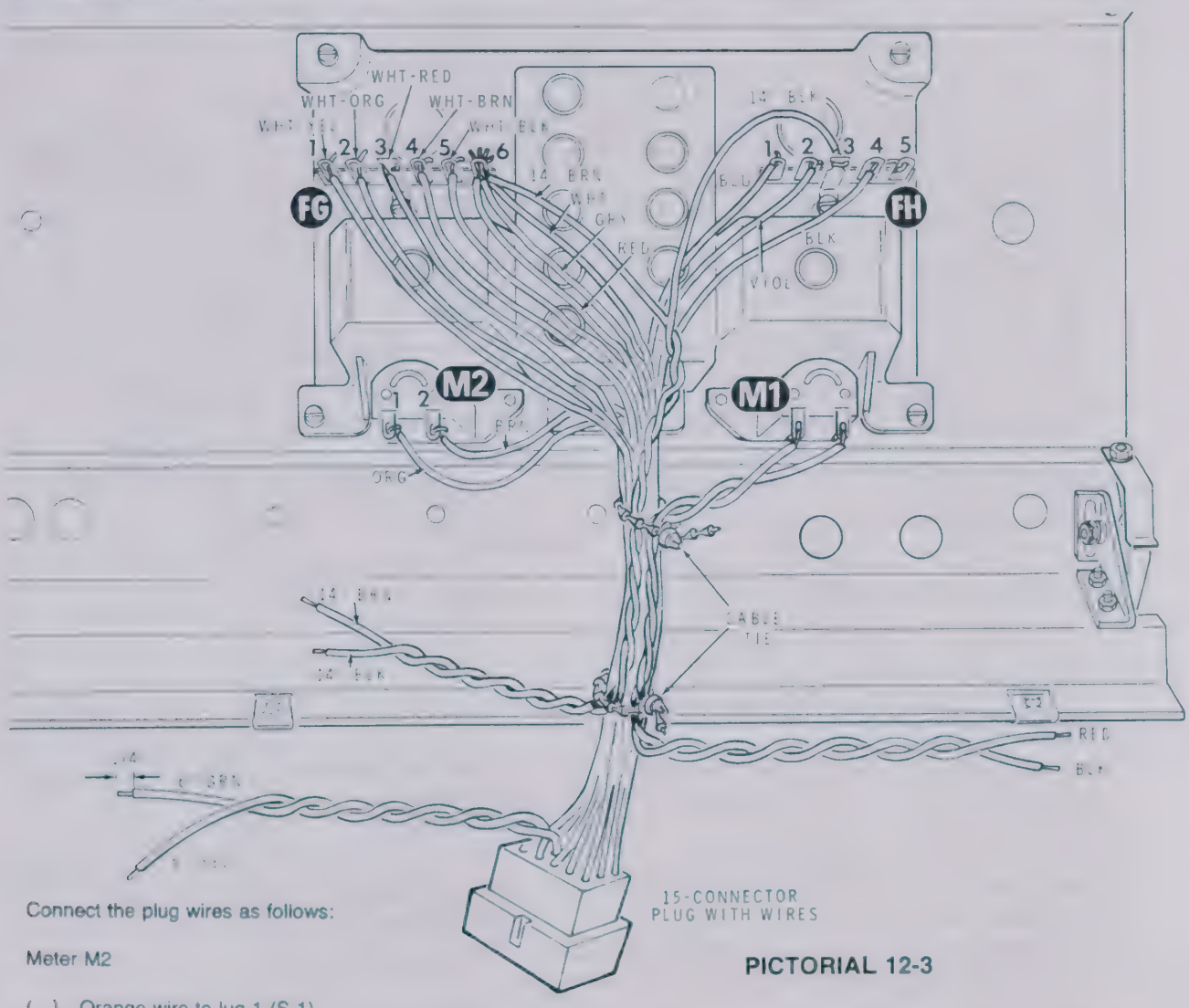
( ) L10: Lamp from FG lug 6 (NS) to FH lug 5 (NS).

Refer to Pictorial 12-3 for the following steps.

( ) Position the 15-connector plug with wires as shown and cut all the wires to 8". Measure them from where they come out of the plug.

( ) Cut the yellow and green wires to 6" and twist the two wires together.

( ) Remove 1/4" of insulation from all the wire ends.



PICTORIAL 12-3

Connect the plug wires as follows:

Meter M2

( ) Orange wire to lug 1 (S-1).

( ) Brown wire to lug 2 (S-1).

Terminal strip FG

( ) White-yellow to lug 1 (S-2).

( ) White-orange to lug 2 (S-2).

( ) White-red to lug 3 (S-2).

( ) White-brown to lug 4 (S-2)

( ) White-black to lug 5 (S-2).

( ) Red, gray, and white wires to lug 6 (NS)

Terminal strip FH

( ) Blue to lug 1 (S-2)

( ) Violet to lug 2 (S-2).

( ) Remove an additional 1/4" of insulation from the black wire and connect the wire through lug 4 (S-7) to lug 5 (S-6).

( ) Twist the wires into a bundle as shown.

( ) Prepare a 14" brown and a 14" black solid wire.

( ) Connect the brown wire to terminal strip FG lug 6 (S-6).

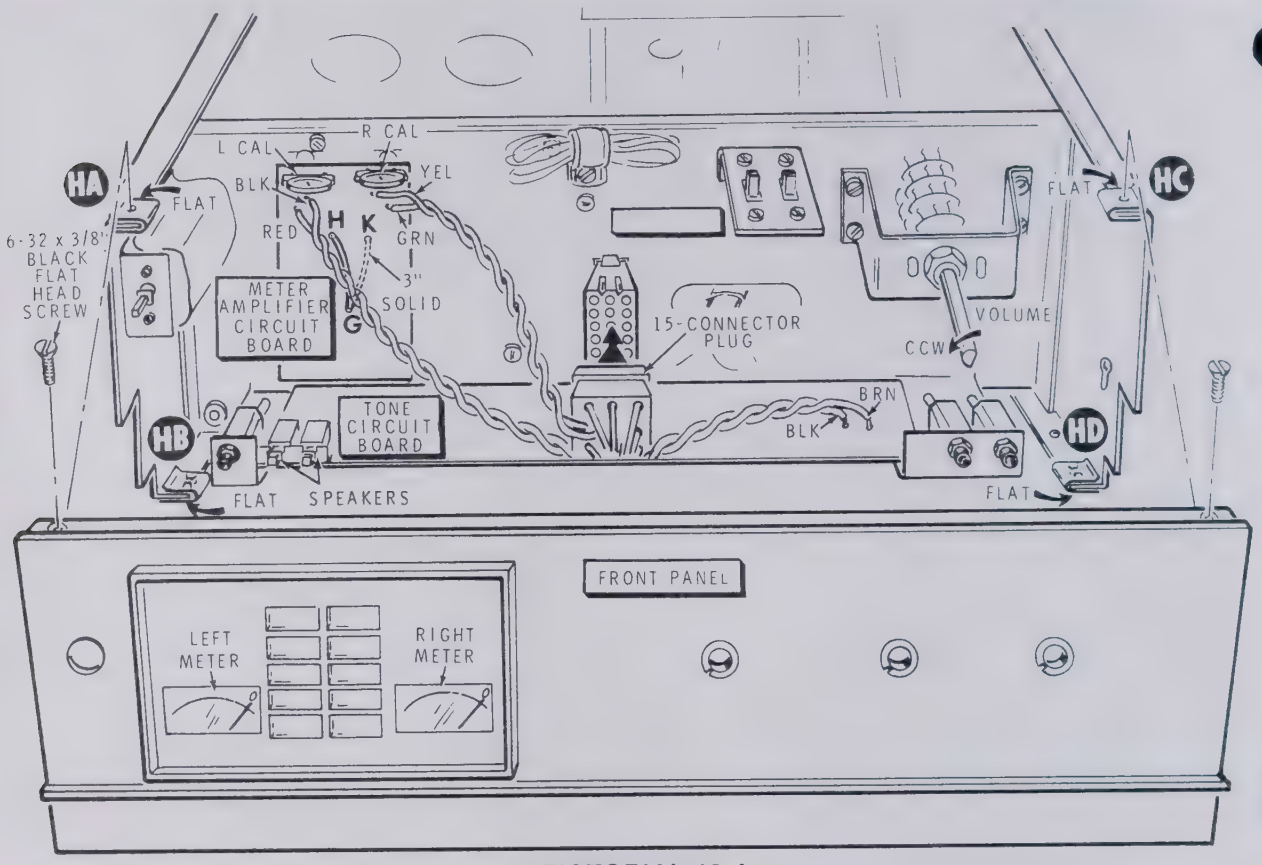
( ) Connect the black wire to terminal strip FH lug 3 (S-2)

( ) Twist the brown and black wires together.

( ) Twist the two wires coming from meter M1 together

( ) Position the wires as shown and install two cable ties

( ) Check the terminal strip lug connections to be sure all the wires are soldered.



PICTORIAL 12-4

Refer to Pictorial 12-4 for the following steps.

( ) Install two thin push-on nuts onto the left side panel. Be sure the flat side of the nut at HA is *up*, and the flat side of the one at HB is *down*.

( ) Install two thin push-on nuts onto the right side panel. Be sure the flat side of the nut at HC is *up*, and the flat side of the one at HD is *down*.

( ) Position the front panel near the chassis and push the 15-connector plug onto the socket.

Connect the indicated four wires to the meter amplifier circuit board as follows. Push each wire into its connector.

( ) Red to RED.

( ) Black to BLK.

( ) Yellow to YEL

( ) Green to GRN.

Connect the remaining two wires to the connectors on the tone circuit board as follows:

( ) Brown to BRN.

( ) Black to BLK.

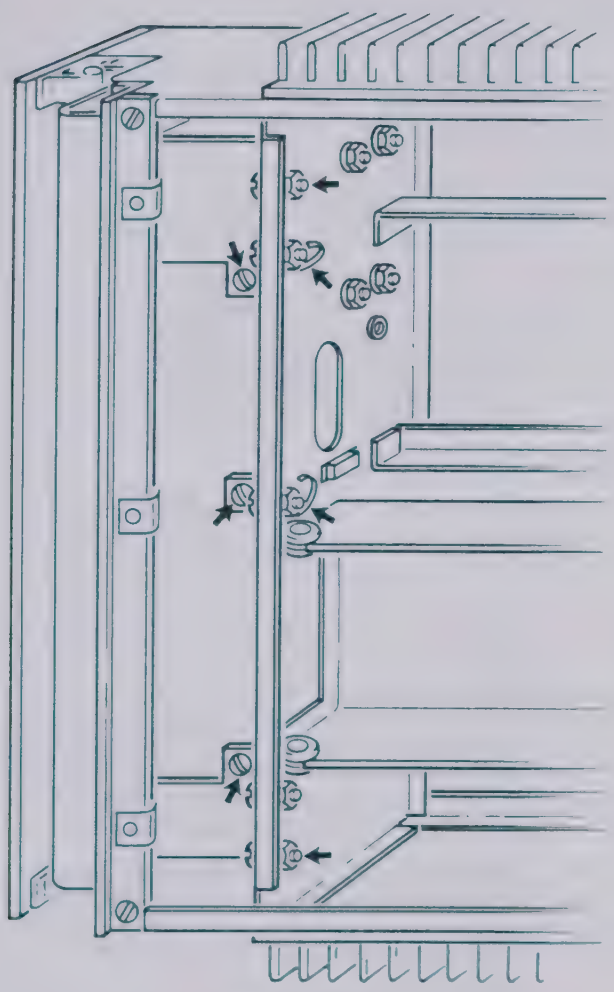
( ) Prepare a 3" length of any color solid wire you have left.

( ) Push the wire ends into connectors G and H on the meter amplifier circuit board.

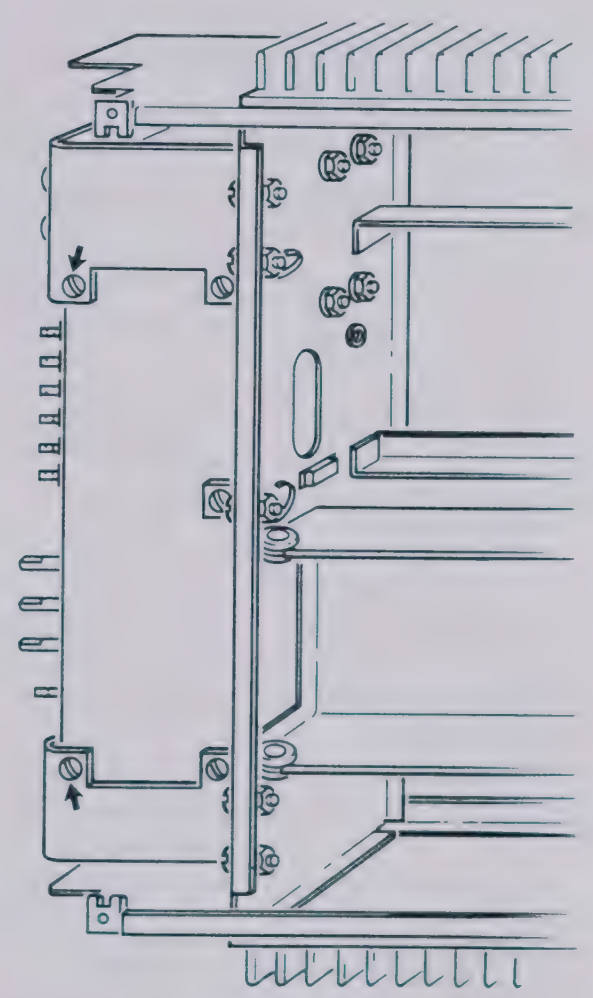
( ) Be sure the L CAL and R CAL controls are at their centers of rotation.

( ) Push the two SPEAKERS switches to the in position, and turn the VOLUME control fully counterclockwise.

( ) Plug in the line cord and adjust the L CAL control on the meter amplifier circuit board for a meter indication of exactly 0 dB on the left meter.



Detail 12-4A



Detail 12-4B

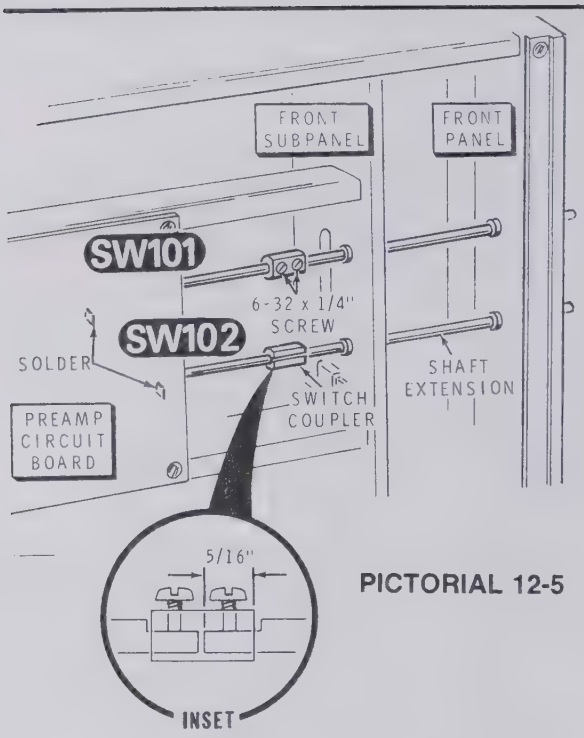
( ) Remove the wire from connector H and insert it into connector K. Then adjust the R CAL control for a meter indication of exactly 0 dB on the right meter.

( ) Unplug the line cord. Then remove and discard the 3" solid wire from the meter amplifier circuit board.

( ) Temporarily mount the front panel in place with four 6-32 x 3/8" black flat head screws. Be sure the phone jacks and switch shafts line up with their holes in the front panel.

( ) Refer to Detail 12-4A and tighten the eight indicated screws.

( ) Remove the front panel, refer to Detail 12-4B and tighten the remaining two screws in the tone circuit board. Then replace the front panel.



PICTORIAL 12-5

Refer to Pictorial 12-5 for the following steps.

( ) Start two 6-32 × 1/4" screws into each of the two switch couplers.

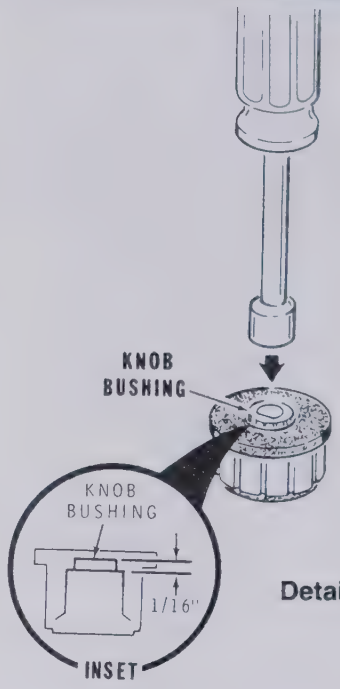
( ) Slide a switch coupler as far as it will go onto the shaft of switch SW102. Secure it in place with a 6-32 x 1/4" screw.

( ) Slide the 5/16" end of a shaft extension through the nylon bearings in the front panel and front subpanel, and secure the shaft extension in the switch coupler with a 6-32 × 1/4" screw. See the inset drawing.

( ) Solder the switch solder lug to the foil of the preamplifier circuit board and cut off the excess solder lug.

( ) In the same manner, install a switch coupler and shaft extension onto switch SW101. Then solder the solder lug to the foil and cut off the excess solder lug.

Detail 12-6A



Detail 12-6B

Refer to Pictorial 12-6 (in the "Illustration Booklet") for the following steps.

( ) Use an adjustable or 1/2" open-end wrench, or a pair of pliers, to tighten the control nut on the VOLUME control. Then operate the control to be sure it operates freely. If it does not operate freely, readjust the control nut and control bracket screws as necessary.

( ) Refer to Detail 12-6A and push knob inserts onto the MODE, SELECTOR, and VOLUME shafts.

( ) Rotate these three shafts to their fully counterclockwise position.

( ) Line up the pointer of a large knob with the MONO mark on the front panel of the MODE switch. Then press the knob part way onto the bushing.

( ) Now carefully remove *both* the bushing and the knob. Do not allow the knob to come off the bushing.

( ) Refer to Detail 12-6B and place the knob and bushing on a table or other firm surface. Place a soft cloth under the knob to prevent it from being marred. Use a nut driver or a large screwdriver and drive the bushing into the knob until it is 1/16" above the inner surface as shown in the inset drawing.

( ) Replace the knob onto the MODE switch. Be sure the pointer is lined up with MONO mark. Also, do not push the knob on so far that it rubs on the front panel.

Detail 12-6C

( ) In a similar manner install large knobs onto the SELECTOR switch and the VOLUME control. Be sure the SELECTOR knob pointer points to AUX, and the VOLUME knob pointer points to LO.

( ) Pivot down the front door panel.

( ) Rotate the BASS, TREBLE, and BALANCE controls fully counterclockwise.

( ) Push three small knobs with pointers onto the BASS, TREBLE, and BALANCE controls. Be sure the pointers are at the 7 o'clock position.

( ) Push the remaining knobs onto the remaining nine switches. If these switches bind, readjust any hardware and parts as necessary until the switches operate freely.

( ) Raise the front door panel, remove the protective paper backing, and press the Heathkit nameplate to the door panel as shown in Detail 12-6C.

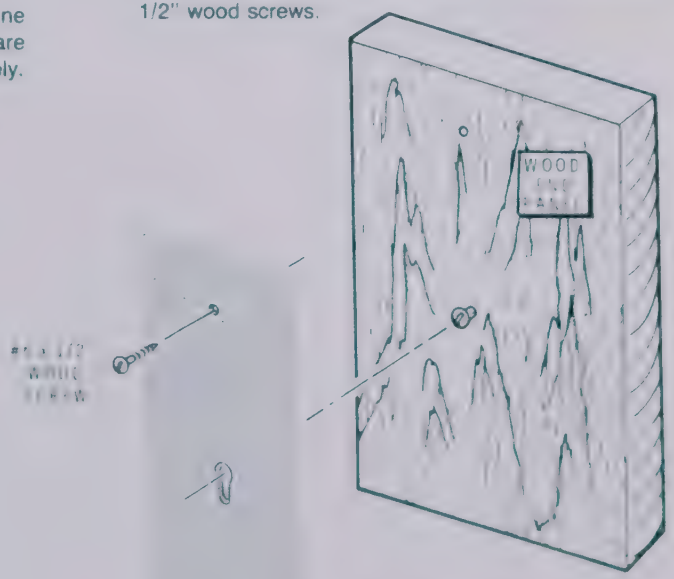
( ) Refer to Detail 12-6D, position a wood end panel as shown, and install a #6 x 1/2" wood screw in the lower hole. Leave the screw head 1/16" from the wood as shown.

( ) Install another #6 × 1/2" wood screw all the way into the other hole. Then remove the screw.

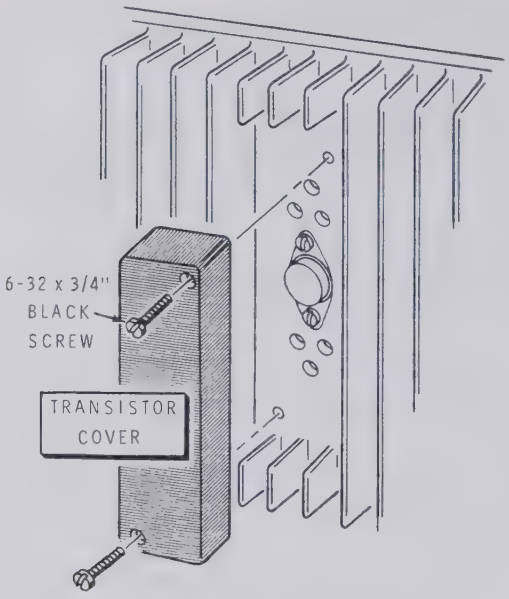
( ) Refer to Detail 12-6E and mount the end panel with only the one screw as shown (NOTE: If the end panel is loose, remove it and adjust the screw so the panel fits snugly). Then install the other #6 x 1/2" wood screw.

( ) As before, install the other wood end panel with two #6 x 1/2" wood screws.

Detail 12-6D



Detail 12-6E



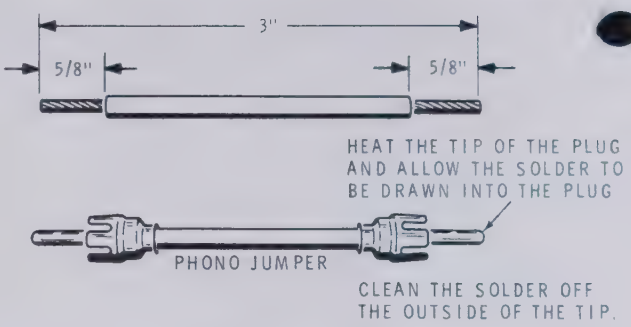
Detail 12-6F

( ) Refer to Detail 12-6F and mount a transistor cover on a power amplifier heat sink. Use two 6-32 x 3/4" black screws.

( ) In a similar manner mount the other three transistor covers.

( ) Remove the protective backing from the six pieces of insulating paper and apply the paper to the top areas of the Amplifier as shown in Pictorial 12-6.

( ) Remove the protective paper and any other coatings from the window, wipe the window free of finger prints, etc., and press the window into the bezel.



Detail 13-1A

Refer to Pictorial 13-1 for the following steps.

( ) Refer to Detail 13-1A and prepare two 3" large black stranded wires as shown. Then solder phono plugs on both ends of each wire.

( ) Insert one phono jumper between the left channel PREAMP OUT and PWR AMP IN sockets on the rear panel.

( ) Insert the other jumper between the right channel PREAMP OUT and PWR OUT AMP IN sockets.

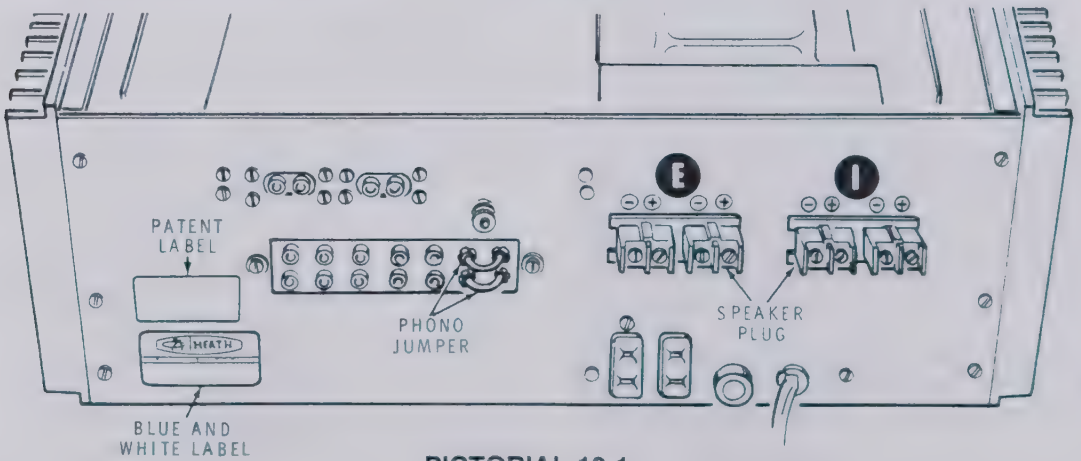
( ) Plug two speaker plugs into socket E as shown.

( ) Plug two speaker plugs into socket I as shown.

( ) Carefully peel away the backing paper from the blue and white label. Then press the label onto the rear panel as shown. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

( ) In the same manner, install the patent label on the rear panel.

This completes the "Step-By-Step Assembly." Proceed to "Final Tests."



PICTORIAL 13-1

FINAL TESTS

SPEAKER PROTECTION - CAUTION

KINDS OF SPEAKER DAMAGE

With the popularity of very high sound levels, it is exceedingly difficult to protect speaker systems from all possible causes of electrical damage. Basically, there are three types of speaker failures:

1. Thermal damage — Due to excessive current, the voice coil of a driver heats and becomes permanently damaged.

2. Voice coil collapse — In this case, the voice coil of a driver actually slams into the frame or magnet structure, causing the voice coil to bend or collapse.

3. Crossover damage — The crossover component or network is damaged due to excessive voltage and/or current.

Many speaker manufacturers protect against thermal damage by using fuses. If a single fuse is used for the whole speaker system (as opposed to fusing each driver in the system), only the woofer (bass speaker) will be protected from thermal damage. High frequency speakers, tweeters and midranges, are generally protected from DC thermal damage by a series capacitor in the crossover network, but they are not protected from AC thermal damage. Each speaker manufacturer can best recommend the kind of fusing or other protection that will best prevent this type of damage to his system.

It is not practical to externally fuse a speaker system to avoid voice coil collapse, since this type of failure is normally due to a high energy, short duration pulse. This pulse causes the cone excursion to exceed the physical limitations of the frame or magnet structure. Crossover failures or malfunctions are at such a level that thermal failure will normally occur first. These two failure modes are normally uncommon in modern high power speaker systems.

HOW TO AVOID SPEAKER DAMAGE

Heath Company is not and cannot be responsible for damage to speakers or speaker system or other components used with our amplifiers.

Two (2), 1-ampere, *regular-blow* fuses have been furnished with this Amplifier (Receiver). Use them only during the initial checkout procedure and discard them prior to final assembly. They *may not* provide adequate protection for your speaker system. If your speaker manufacturer has recommended use of a smaller fuse (less than 1 ampere), use fuses of that rating during the checkout procedure and discard the 1-ampere fuses immediately. If you have purchased Heathkit speakers, the proper speaker protection information is provided in each Assembly Manual. In many cases, Heath has provided proper fuses with the speaker kit.

If your speaker manufacturer suggests speaker protection other than fusing, follow his instructions; but you may also use speaker fuses of the proper value to supplement the primary protection recommended by the manufacturer. Always follow the speaker protection procedure suggested by the manufacturer of your speakers — he knows his product best and wants you to properly protect your investment to the highest degree possible.

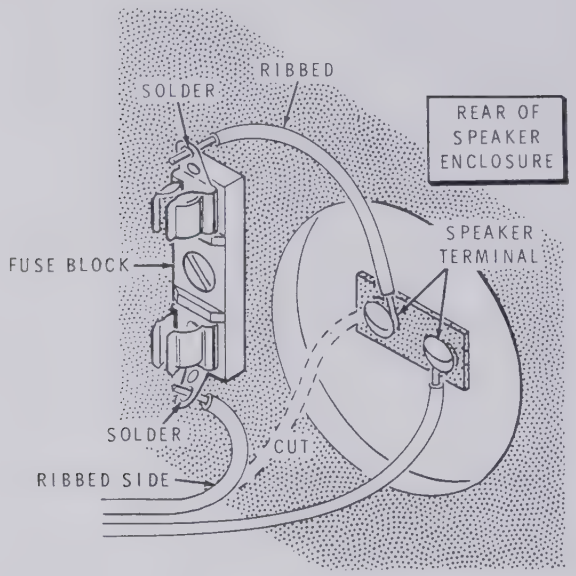


Figure 1-2

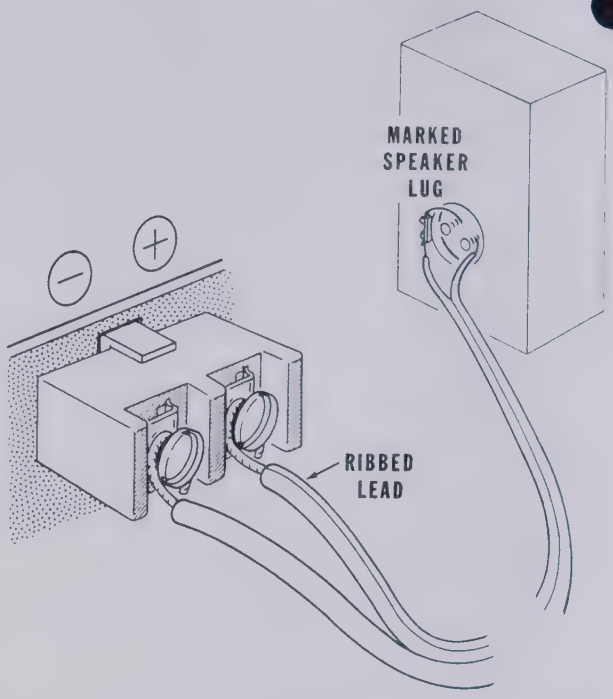


Figure 1-3

FUSE INSTALLATION

( ) Locate two fuse blocks and two #6 x 1/2" wood screws.

NOTE: Ordinary lamp cord wire is recommended for hookup wire between the Amplifier and the speakers.

Refer to Figure 1-2 and complete the following steps twice, once for the left speaker and once for the right speaker.

( ) ( ) If your speaker terminals are not labeled, connect either lamp cord lead to either speaker terminal.

( ) ( ) If your speaker terminals are labeled, connect the ribbed lead of the lamp cord to the marked speaker terminal and the plain lead to the unmarked speaker terminal.

( ) ( ) Install a fuse block on the back of the speaker enclosure near the speaker terminal that has the ribbed lead connected to it. Use a #6 x 1/2" wood screw.

( ) ( ) Cut the ribbed speaker lead so the cut ends will reach the fuse block.

( ) ( ) Remove 1/4" of insulation from each of the cutoff leads. Twist together the small wires on each lead and apply a small amount of solder to hold the separate strands together.

( ) ( ) Solder one of these cutoff leads to the lug at each end of the fuse block.

( ) ( ) Install the fuse in the fuse block.

NOTE: If the fuses blow after your system is hooked up, check the entire system for possible short circuits.

Perform the next two steps twice, once for each speaker.

( ) ( ) Refer to Figure 1-3 and connect the ribbed lead of the speaker wire to the indicated screw of the speaker plug on the back of your Amplifier.

( ) ( ) Connect the plain lead of the speaker wire to the other screw of the speaker plug.

HUM INJECTION TESTS

Refer to Figure 1-4 (in the "Illustration Booklet") and set the front panel controls and switches as follows:

( )	MODE	MON
( )	SELECTOR	AUX
( )	VOLUME	Fully counterclockwise
( )	SPEAKERS	IN
( )	BASS	Center of rotation
( )	TREBLE	Center of rotation
( )	BALANCE	Center of rotation
( )	TONE FLAT	OUT
( )	HI FILTER	OUT
( )	LO FILTER	OUT
( )	LOUD	OUT
( )	TAPE MON	OUT
( )	TAPE DUBBING	OUT

NOTE: If you do not get the indicated results in the following steps, unplug the line cord and refer to "In Case of Difficulty" on Page 109. Repair the trouble before you proceed.

( ) Plug in the line cord and push the POWER switch to ON. The meters should both light up and the display should indicate MON and AUX. NOTE: Your speakers will be completely silent for 5 or 6 seconds because of the built-in muting circuits.

( ) Turn the MODE switch to 2 CH. The display should indicate 2 CH.

( ) Turn the SELECTOR switch through TAPE, TUNER, PHONO 1, and PHONO 2 positions. The display should in turn indicate each position of the switch. Leave the switch in the PHONO 2 position.

( ) Push the TAPE MON switch. The display should indicate TAPE MON.

( ) Push the TAPE MON switch again so the TAPE MON indication turns off.

To make the following tests, use a small screwdriver and grasp it so that one finger touches the shaft. Then touch the test points with the tip. You should hear a hum from the specified speakers when each point is touched. Be careful to touch only the points specified.

NOTE: You can reach each of the following points by inserting the screwdriver into the input jacks and touching the center lug; or you can reach the center lug from the bottom of the chassis.

( ) Turn the VOLUME control 1/4 turn clockwise.

( ) Touch the LEFT PHONO #2 input; you should hear a hum from the left speaker and the left meter should indicate up-scale.

( ) Touch the RIGHT PHONO #2 input; you should hear a hum from the right speaker and the right meter should indicate up-scale.

( ) Turn the SELECTOR switch to PHONO 1.

( ) Touch the LEFT PHONO #1 input; you should hear a hum from the left speaker.

( ) Touch the RIGHT PHONO #1 input; you should hear a hum from the right speaker.

( ) Turn the VOLUME control to its midrange position.

( ) Push in the TAPE MON switch.

( ) Touch the LEFT TAPE MON input; you should hear a hum from the left speaker.

( ) Touch the RIGHT TAPE MON input; you should hear a hum from the right speaker.

( ) Push the TAPE MON switch to its out position.

( ) Turn the SELECTOR switch to TUNER.

( ) Touch the LEFT TUNER input; you should hear a hum from the left speaker.

( ) Touch the RIGHT TUNER input; you should hear a hum from the right speaker.

( ) Turn the SELECTOR switch to TAPE.

( ) Touch the LEFT TAPE input; you should hear a hum from the left speaker.

( ) Touch the RIGHT TAPE input; you should hear a hum from the right speaker.

( ) Turn the SELECTOR switch to AUX.

( ) Touch the LEFT AUX input; you should hear a hum from the left speaker.

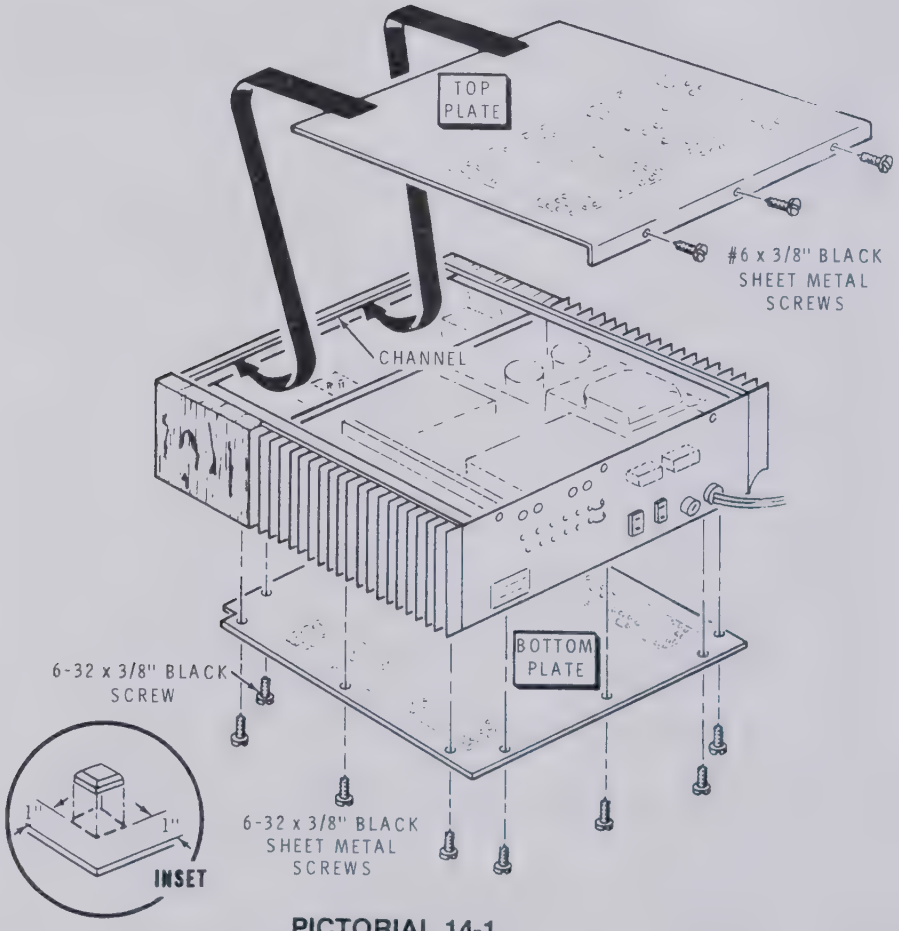
( ) Touch the RIGHT AUX input; you should hear a hum from the right speaker.

( ) Turn the MODE switch to MONO.

( ) Touch the RIGHT AUX input; you should hear a hum from both speakers.

This completes the tests of your Amplifier. Proceed to "Final Assembly."

FINAL ASSEMBLY



PICTORIAL 14-1

Refer to Pictorial 14-1 for the following steps.

( ) Insert the front edge of the top plate into the channel in the front panel. Then set the top plate down and secure it to the rear panel with three #6 x 3/8" black sheet metal screws.

NOTE: In the following step, you will install the bottom plate. The plate is nonsymmetrical; if the holes do not line up properly, turn the plate over.

( ) Position the Amplifier up on one of its sides and secure the bottom plate in place with three 6-32 x 3/8" black screws in the front panel and nine #6 x 3/8" black sheet metal screws at the other mounting locations.

( ) Refer to the inset drawing, remove the protective backing from a plastic foot, and press it in place in a corner on the bottom plate as shown.

( ) In a similar manner, install the other three plastic feet.

INSTALLATION

This Integrated Stereo Amplifier requires that special precautions to be taken to allow for sufficient ventilation around the amplifier heat sinks. If the unit is going to be built into a wall or a panel, a minimum of two inches of free air space above and below the heat sinks is required. In addition, be sure to allow not less than two inches of free air space between the heat sinks and the wall (or panel).

Refer to the following section if you intend to custom install your amplifier in a wall or a panel. If you do not intend to custom install your amplifier, disregard the following section and proceed to "Connecting the Amplifier to Your System."

CUSTOM INSTALLATION

When you plan your installation, keep in mind that the Amplifier requires ventilation and that the INPUT sockets, SPEAKER connections, and the FUSE holder on the rear of the chassis must be accessible. The connecting cables should be long enough so they can be connected or disconnected when the Amplifier is removed from its installed position.

Make sure there is adequate support for the rear part of the Amplifier. The method you use to secure the mounting board to the panel or wall area will depend on the specific conditions you encounter in your installation.

CONNECTING THE AMPLIFIER TO YOUR SYSTEM

INPUT CONNECTIONS

Shielded cables terminated in standard phono plugs should be used to connect all signal sources to the input sockets of your Amplifier. For 2-channel stereo program material, use two separate shielded cables for each signal source (two "phono" cables, two "tape" cables, etc.). Connect the shielded cables coming from your record changers or turntables, tuner, tape recorder, etc. to the appropriate inputs as shown in Figure 1-5 (in the "Illustration Booklet"). The following paragraphs indicate which input you should use for various types of signal sources

Tuner Input Jacks

Use these inputs with an FM or AM/FM tuner.

Phono Input Jacks

Use these inputs with turntables or changers that use low-level magnetic or variable reluctance phono cartridges.

Auxiliary Input Jacks

Use these inputs for high-level signal sources such as a TV set, or a turntable or record changer equipped with a crystal or ceramic phono cartridge. The BASS control on the Amplifier should be adjusted to compensate for the loss of low frequencies when you use these cartridges.

Tape Input Jacks

(See the "Operation" section on Page 107.)

Use these inputs for high-level signals from tape decks, tape players, or cassette player-recorders.

Tape Monitor Jacks

(See the "Operation" section on Page 107.)

Use these inputs if your tape recorder has stereo line outputs or separate tape monitor outputs. The material just recorded on the tape and fed into the MON (tape monitor) input jacks will provide instantaneous monitoring of the recording

Most modern tape recorders have a "line" output and a "tape/source" switch. With this type of recorder, connect the "line" output into the TAPE MON input jack on your Amplifier. Then while you record, the tape/monitor switch allows you to listen to either the materal just after it is recorded (tape) or just before it is recorded (source).

NOTE: If you have no tape monitoring facility, these connections may be used as additional inputs for high-level signal sources.

Power Amplifier Input Jacks

Remove the jumper wires and use these inputs for signals from an external preamplifier or electronic crossover. This signal would then be amplified by the Amplifier's power amplifier. Before the Amplifier can be used normally again, the jumper wires shown in Figure 1-5 must be replaced.

Dubbing Input Jack

Use this convenient front panel input for signals from another tape deck, tape player, or cassette player-recorder.

OUTPUT CONNECTIONS

Phones

A stereo PHONES output jack is on the front panel. The sound reproduction from the PHONES jack will be the same as from the appropriate speaker systems except for its low level output.

Figure 1-6 shows a type of plug that can be installed on the end of a stereo headphone cable. The tip of the plug connects to the left channel, the ring connects to the right channel, and the sleeve is the common connection. This phone plug can also be used as indicated with the Tape Dubbing jacks.

Preamp Out Jacks

With the rear panel jumper wires removed, these output signals drive an external accessory product such as a frequency equalizer, electronic speaker crossover system, or another preamplifier.

These signals vary with the VOLUME, BALANCE, and TONE controls (when not in the TONE FLAT mode). For normal use, be sure to replace the jumper wires.

Tape Out Jacks

Connects the Amplifier signals to a tape recorder. These signals do not vary with the VOLUME, BALANCE, and TONE controls. If you want a monophonic signal, place the MODE switch to MONO.

Dubbing Out Jack

Connects to appropriate input circuit of tape recorder or cassette recorder. Provides output signal separate from VOLUME, BALANCE, and TONE controls when a signal is fed to any of the rear panel inputs and the TAPE MONITOR switch is off.

AC OUTLETS

CAUTION: Under no conditions should the total combined AC power obtained from these sockets exceed 360 watts.

Unswitched Outlet

Supplies AC power to devices such as record changers, or tape decks to prevent them from being damaged if you turn off the power at the Amplifier before you shut off the changer or tape deck mechanism.

Switched Outlet

Supplies AC power to other external equipment such as a tuner. The other equipment may then be turned on or off by the POWER switch on the Amplifier.

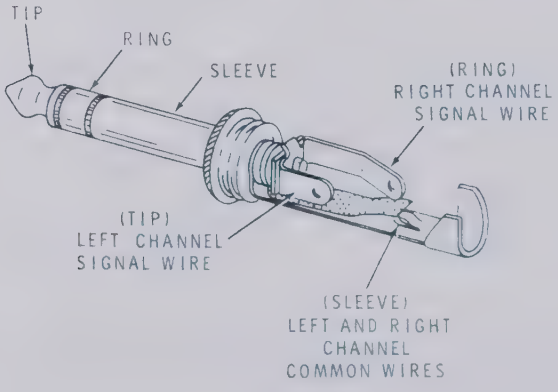


Figure 1-6

SPEAKER SYSTEMS

Total speaker impedance should not be less than 4 ohms per channel. You will obtain the best performance with speaker systems of from 4 to 16 ohms impedance.

IMPORTANT: The SPEAKER 1 and 2 switches are connected in parallel. The total impedance of the speakers connected to both left speaker terminals (or both right speaker terminals) should be 4 ohms or greater. Maintaining a total impedance of 4 ohms per channel will insure that the Amplifier will operate safely, without failure or damage.

SPEAKER PLACEMENT

Proper speaker placement depends a great deal on the size and accoustic properties of the room and the high frequency dispersion characteristics of the speakers. Generally, for stereo listening the two speakers should be spaced four to eight feet apart and, if possible, at least 3 feet out from room corners. They should be placed along a wall facing the listening area. Identical speakers or speaker systems are recommended for stereo operation.

Correct spacing between speakers depends to some extent on the listener's position and his distance from the speakers. If the listener is too close to the speakers, you may be able to improve the stereo effect if you move the speakers closer together.

Remember that stereophonic reproduction attempts to re-create, as accurately as possible, not only the sounds of the "right" and "left" origin, but also those near the center. Experiment with the speaker locations and listening position for the best results.

SPEAKER PHASING

The left and right channel speakers should be connected so they are "in phase" with each other. This means that the speaker cones in both the left and right channel speaker systems should move in the same direction at the same time when driven by identical signals.

Speaker terminals are usually marked to identify one terminal from the other. This may be by number, color, dot, minus (—) and plus (+), or some other designation. How your speaker terminals are marked is not important, just so you can distinguish one terminal from the other. If your speaker terminals are marked, perform the steps under "Marked Speakers." If your speakers are not marked, perform the steps under "Unmarked Speakers." (Use lamp cord or other heavy-gauge wire.)

Marked Speakers

Connect the lamp cord coming from the Amplifier LEFT SPEAKER terminals to your left speaker as follows:

( ) Ribbed lead to the marked speaker terminal.

( ) Plain lead to the unmarked speaker terminal.

Connect the lamp cord coming from the Amplifier RIGHT SPEAKER terminals to your right speaker as follows:

( ) Ribbed lead to the marked speaker terminal.

( ) Plain lead to the unmarked speaker terminal.

Proceed to the "Operation" section on Page 107.

Unmarked Speakers

Read through the entire "Unmarked Speakers" section before you perform any of the following steps.

Connect the lamp cord from the Amplifier LEFT SPEAKER terminals to your left speaker as follows:

( ) Ribbed lead to either speaker terminal.

( ) Plain lead to the other speaker terminal.

Connect the lamp cord coming from the Amplifier RIGHT SPEAKER terminals to your right speaker as follows:

( ) Ribbed lead to either speaker terminal.

( ) Plain lead to the other speaker terminal.

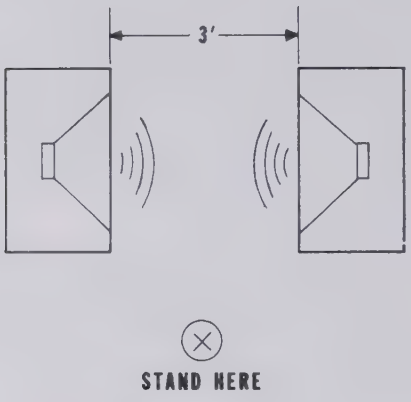


Figure 1-7

Refer to Figure 1-5 (in the "Illustration Booklet") and then connect your accessory equipment to the Amplifier.

( ) Turn on your system and apply a signal to the Amplifier input. Make sure the MODE switch is in the MONO position.

( ) Turn the speakers so they face each other and are approximately three feet apart. See Figure 1-7.

NOTE: Turn off the entire system before you disconnect any wires.

( ) As you stand in front of the speakers as shown, note the loudness of the bass notes. Now interchange the two wires of the right speaker and listen again. When you hear the loudest bass tone, the speakers are in phase. If the bass tones diminished when you interchanged the wires, the speakers were in phase before and are now out of phase; change the two speaker wires back to the previous connections.

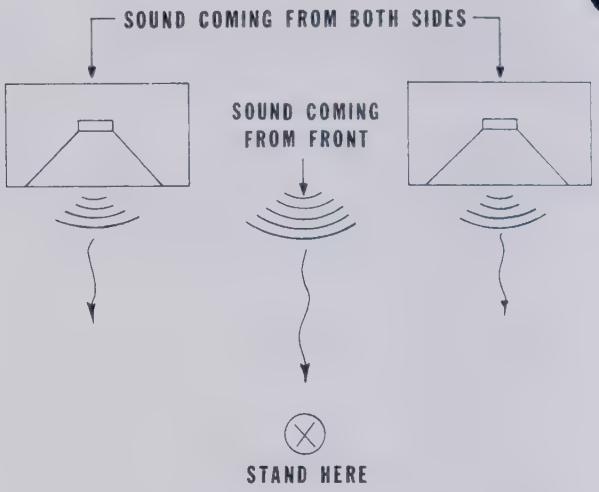


Figure 1-8

NOTE: If your speaker system cannot be moved, you can use the following method to check the phasing.

( ) Stand in front of the speakers, as shown in Figure 1-8. If the sound seems to be coming directly from the front, the speakers are in phase. If the sound comes from both sides, the speakers are out of phase; interchange the two wires on one speaker. This will bring them into phase.

OPERATION

After you push the POWER switch to ON, the speakers will be silent for five or six seconds until the internal muting circuitry connects them to the output amplifiers.

Refer to Figure 1-4 (in the "Illustration Booklet") for a description of each control and switch.

LO FILTER

This filter affects frequencies below 20 Hz. Therefore, you may not be able to hear its effect under normal listening conditions. However, some recorders, changers, and turntables produce subaudible mechanical or electrical noise which can make the material sound muddy or fuzzy. Your LO FILTER will reduce this distortion and help prevent the woofer speakers, and possibly the Amplifier, from being overdriven at loud listening levels. (See the graph on Page 122.)

HI FILTER

High frequency filters are most effective when the program material is noisy. It may also be possible to reduce 10 kHz AM whistles. However, whenever you reduce noise above 7 kHz, this also reduces the frequency response. (See the graph on page 122.)

OUTPUT METERS

These meters very effectively indicate peak program levels and show when maximum Amplifier operating levels are reached. Because of the fast meter action and the inability of the eye to follow some types of program material, you should keep peaks no greater than the −2 dB point down from the 0 dB point on the meter with 8-ohm speaker systems. This will insure that your Amplifier will not be overloaded. Remember that if you operate your Amplifier at or near these meter levels, the sound will be very loud — depending on the efficiency of your speaker system. Whith 4-ohm speaker systems, meter peaks should be no greater than the −3 dB point down from the 0 dB point on the meter.

TONE CONTROLS

These controls affect the frequency extremes rather than the mid-frequencies. (See the graph on Page 121.) This better equalizes speaker or program deficiencies for the most natural tonal conditions. There is also sufficient tone range (with high quality speaker systems) to produce additional bass or treble action without adding unnatural tonal qualities.

TAPE RECORDER

Proper connections to the tape recorder are illustrated in Figure 1-5.

CAUTION: DO NOT CONNECT A TAPE RECORDER INPUT TO THE AMPLIFIER SPEAKER TERMINALS OR THE LUGS OF YOUR SPEAKERS, as some recorder manufacturers recommend, or the Amplifier output could become short circuited through the common ground of the tape recorder. Also, many tape recorders place a short circuit across their input terminals while they are not being used.

The signals of any program material you select will appear at both TAPE OUT jacks on the rear panel regardless of the settings of the VOLUME controls on the front panel. Therefore, if you connect cables from the TAPE OUT jacks to the inputs of your tape recorder, you can record program material from any input source connected to your Stereo Amplifier.

The tape recording procedure is basically the same for all programs sources. Therefore, the following steps will describe the operation when you are using an FM Tuner as a source of stereo program material.

TAPE RECORDING AND PLAYBACK/MONITOR

Most all newer reel-to-reel tape recorders (plus a few top quality cassette recorders) have a tape monitor/source switch. These recorders need only one stereo output (sometimes called the "line" output). The tape monitor/source switch on these recorders causes the recorded material to be played back when it is in the tape monitor position. Also, you can listen to the signal source when the switch is in the source monitor position. Refer to the instruction manual for your tape recorder for its operation and connections to your Amplifier.

Typical connections are:

- Connect the respective LEFT and RIGHT TAPE OUT jacks of your Amplifier to the respective inputs ("line") of your tape recorder.
- Connect the respective ("line") outputs of your tape recorder to the TAPE MON inputs of the Amplifier.

Whenever you use your tape recorder, you should push the Amplifier's TAPE MON switch to ON. Then use the SELECTOR switch to choose the signal source to be recorded. Use the TAPE inputs with any other tape machine that does not have a built-in monitor facility. See Figure 1-5.

For tape recorders with separate tape monitor and line output jacks connect the Amplifier TAPE MON and TAPE inputs respectively. Connect the Amplifier TAPE OUT to the recorder's input as before. To monitor the recorded material, push the TAPE MON switch on the Amplifier to ON. For playback, position the Amplifier SELECTOR switch to the TAPE (input) position.

Tape Dubbing

The DUBBING front panel switch and jacks are provided so you can quickly and easily set up your recorder to play and record through the Amplifier.

Connect the tape recorder output to the DUBBING IN jack and the tape recorder input to the DUBBING OUT jack.

TAPE RECORDER PLAYBACK - Set your recorder for stereo playback operation. Push the TAPE DUBBING switch in (ON). The recorder will now play through the Amplifier and the SELECTOR switch will have no effect. Adjust the Amplifier controls for the desired output level.

TAPE RECORDING - Set your tape recorder to record. NOTE: The TAPE MON switch must be off (OUT). Your recorder will now record the program material selected by the Amplifier's SELECTOR switch.

IN CASE OF DIFFICULTY

> WARNING: Dangerous high AC voltage is present when the line cord plug is connected. Dangerous, high AC and DC voltages are present when the Amplifier is turned ON. See Figure 1-1 (in the "Illustration Booklet").

This part of the Manual will help you locate and correct any difficulty which might occur in your Amplifier. It is divided into three sections. The first section, "General," contains suggestions of a general nature in the following areas:

A. Visual checks and inspections.

B. Precautions to observe when bench testing.

C. How to determine the area of the Amplifier in which the trouble is located ("How to Troubleshoot Your Amplifier").

The second section consists of a"Troubleshooting Chart." This chart calls out specific problems that may occur and lists one or more conditions or components that could cause each difficulty. The resistor R numbers, capacitor C numbers, coil L numbers, and the transformer T numbers are identified in these charts by the same numbers that are used in the "Parts List," in the assembly steps, and on the Schematic Diagram. "Circuit Board X-Ray Views" (Page 129) are also provided to help you locate the components and test points.

The third section is titled "Checking Components." This section tells you how to use the test meter to check transistors, diodes, and capacitors. Use this section in conjunction with the "Troubleshooting Charts," and with the resistance and voltage tests in the (earlier) testing sections of this Manual.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is inside the front cover. If at any time you have to return your unit to Heath Company for service, remove the wood side panels and keep them as they are easily damaged in shipment.

Important

In an extreme case where you are unable to resolve a difficulty and shipment to a repair center or to the Heath Company is necessary, please follow these rules.

To save yourself shipping cost and service expense, if you know that the trouble is on a particular circuit board, send only that circuit board for repair.

Do not ship the power amplifier circuit boards and heat sink in the same carton with the Amplifier unless they are mounted to the Amplifier.

Refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is inside the front cover

GENERAL

VISUAL CHECKS

1. Again make the visual checks at the end of each circuit board assembly section.

2. About 90 percent of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered properly. Reheat any doubtful connections and be sure all the wires are soldered at places where several wires are connected.

3. Check to be sure that all transistors are in their proper locations, and are installed correctly.

4. Check the value of each part. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and as called out in the wiring instructions. It would be easy, for example, to install a 2200 Ω (red-red-red) resistor in a step that calls for 220 Ω (red-red-brown) resistor.

5. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.

6. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and make contact with the other connections or parts, such as coil shields or the chassis.

7. Check all the wires and cables that are connected to the circuit boards. Make sure the wires do not touch the chassis or other lugs. Make sure all wires are properly soldered.

8. If the difficulty still is not cured, read the "Precautions for Bench Testing" section and the section titled "How to Troubleshoot Your Amplifier."

PRECAUTIONS FOR BENCH TESTING

1. Be cautious when you test transistor circuits. Although transistors have a long life when used properly, they will be almost instantly destroyed when short-circuited.

2. Be sure you do not short any terminals to ground when you make voltage measurements. If the probe should slip, for example, and short out a bias or voltage supply point, it is almost certain to damage one or more transistors or diodes.

3. Do not remove transistors or the IC while the Amplifier is turned on, since this would surely damage the Amplifier.

4. Do not remove circuit boards while the Amplifier is turned on.

HOW TO TROUBLESHOOT YOUR AMPLIFIER

If you know which area your trouble is in, apply the "Visual Checks" listed on this page, to that area.

You may also go directly to the "Troubleshooting Charts" to see if the difficulty you are having is listed in one of the "Condition" columns. If your difficulty is listed there, check the Possible Causes Chart listed for that item and apply the "Visual Check" to the "Area of Difficulty."

TROUBLESHOOTING CHARTS

This "Troubleshooting Chart" lists specific difficulties that could occur in your Amplifier. Several possible causes may be listed for each difficulty.

Refer to the "Circuit Board X-Ray Views" and the "Circuit Board Voltage Charts" on Pages 125 to 130 to locate and identify parts, and check voltages.

NOTE: If you locate a component that you suspect is faulty, refer to the section on "Checking Components" on Page 114.

CONDITION	AREA OF DIFFICULTY	POSSIBLE CAUSE
Amplifier completely dead.	Power supply circuit.	1. Blown fuse. 2. Open line cord or On-Off switch. 3. Power Transformer.
Front panel lamps on but no sound, or front panel lamps on for short time.	Power supply and output amplifier circuits.	1. Bridge rectifier BR1. 2. Diodes D501, D502, D503, D504, D505, or D506. 3. C2, C3, C505, C506, or C509. 4. Output amplifier transistors.
	Speaker switch, Dub, or Tape Mon switch.	1. Speaker switch turned OFF. 2. Dub switch turned ON (in). 3. Tape MON switch turned ON (in).
Right channel dead. Left channel ok.	Output amplifier right channel circuit.	1. Right output amplifier transistors. 2. Refer to "Hum Injection Tests" on Page 101. 3. Check for "0" DC voltage on collector of Q107, Q209, and Q213.
	Tone and filter preamplifier right channel circuit.	
Left channel dead. Right channel ok.	Output Amplifier left channel circuit.	1. Left output amplifier transistors. 2. Refer to "Hum Injection Tests" on Page 101. 3. Check for "0" DC voltage on collector of Q103, Q202, and Q206.
	Tone and preamplifier left channel circuit.	
Distorted output from both channels in all Selector switch positions	Power supply circuit	1. Low positive (+) or negative (−) voltages. Check voltage at test points in power supply, output amplifier, tone and preamplifier circuits.
	Output amplifier circuit	
	Tone and preamplifier circuit	

CONDITION	AREA OF DIFFICULTY	POSSIBLE CAUSE
Hum in left or right channel with no signal input on all Selector switch positons. Volume control at LO.	Left or right channel output amplifier	1. Transistor Q701, Q702, Q703, Q704, Q705, Q706,Q709, Q710, Q711, or Q712. 2. Diode D702
Hum with no signal input on all positions of the Selector switch. Volume control at HI.	Power supply tone, and preamplifier circuits.	1. Power supply, tone, and preamplifier filter (decoupling) capacitors. 2. Possible output transistor problems.
Distorted output from left channel at high volume level in each Selector switch position.	Output amplifier left channel circuit.	1. Transistors Q701, Q702, Q703, Q704, Q705, Q706, Q709, Q710, Q711, or Q712.
Distorted output from right channel at high volume level in all Selector switch positions.	Output amplifier right channel circuit.	1. Transistors Q701, Q702, Q703, Q704, Q705, Q706, Q709, Q710, Q711, or Q712.
High frequency oscillations from left channel output. Amplifier gets very hot.	Output amplifier left channel circuit. Preamplifier left channel circuit.	1. Loose connections at L701. 2. Capactors C205, C215, C704, C713, or C718. 3. Resistor R734 or capacitor C723.
High frequency oscillations from right channel output. Amplifier gets very hot.	Output amplifier right channel circuit. Preamplifer right channel circuit.	1. Loose connections at L701. 2. Capacitor C224, C234, C704, C713, or C718. 3. Resistor R734 or capacitor C723.

CONDITION	AREA OF DIFFICULTY	POSSIBLE CAUSE
Tone controls do not operate	Tone amplifier secondary controls on front panel.	1. Tone Flat switch pushed in. 2. Wiring from Tone Flat switch to output amplifier circuit board.
Lo filter does not operate.	Tone filter circuit.	1. Capacitors C201, C202, C219, and C221. 2. Check for "0" DC voltage on collectors of Q202 and Q209
Hi filter does not operate	Tone filter circuit.	1. Resistors R205, R206, R237, and R238. 2. Capacitors C204 and C223. 3. Check for "0" DC voltage on collectors of Q202 and Q209.
Left meter does not operate.	Meter amplifier circuit.	1. Transistors Q401, Q402, Q403, Q404, and Q405. 2. Diodes D401, D402, D403, and D404. 3. Zener diode ZD407.
Right meter does not operate.	Meter amplifier circuit.	1. Transistors Q406, Q407, Q408, Q409, and Q410. 2 Diodes D405, D406, D407, and D408. 3 Zener diode ZD407
Relay RY51 does not actuate	Muting circuit.	1 Relay RY51. 2 Transistor Q51, Q52, or Q53. 3. Capactor C51
Relay RY51 actuates too fast.	Muting circuit.	1 Capacitor C51 2 Diode D51
Relay RY51 stays in actuated position.	Muting circuit.	1 Transistor Q51, Q52, or Q53 2 Diode D52

CHECKING COMPONENTS

INTRODUCTION

The test meter can be used to check transistors, diodes, and capacitors. Complete the following steps before you proceed to the instructions for the part you have to check.

Set the METER switch to the TEST position.

Set the FUNCTION switch to the R position.

NOTE: DO NOT touch the Test Meter leads during a measurement. The resistance of your skin will affect the accuracy of the measurement.

HOW TO CHECK TRANSISTORS AND DIODES

A. Unsolder and remove the component. (The power transistors are in sockets.)

B. Connect the leads of the component as shown in the two example illustrations: for transistors and diodes.

C. After studying these illustrations, proceed to the charts that follow and locate the component in column #1 that corresponds to the one you removed from the Amplifier. Then follow the instructions at the top of the remaining three columns. A separate test is listed on each line of the chart.

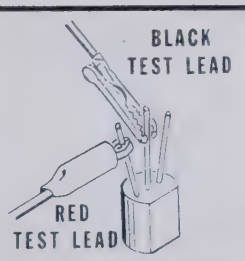
NOTE: These tests check only for open or shorted devices (most failures will be of this nature). Transistors may have low gain, for example, and still pass these tests.

EXAMPLES

TRANSISTORS

Connect the red meter lead to one lead as directed in column #2 of the chart on the following pages.

Connect the black meter lead to another lead as directed in column #3 of the chart on the following pages.



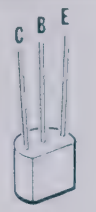
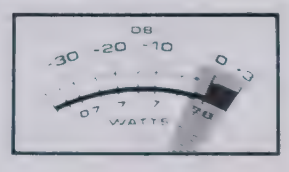
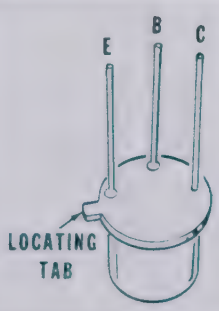
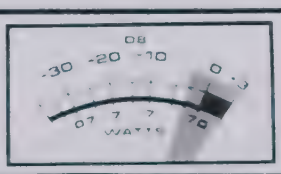
DIODES

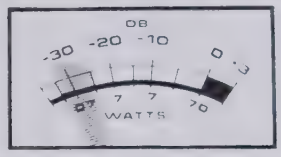
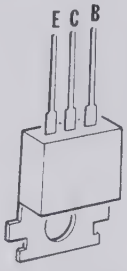
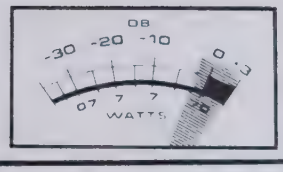
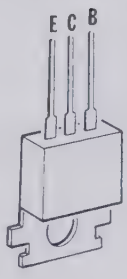
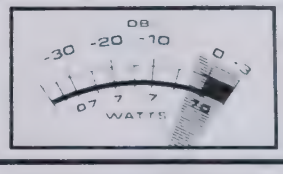
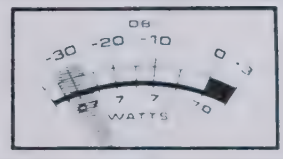
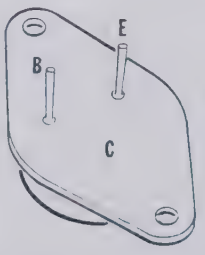
Connect the red meter lead to one lead as directed in column #2 of the chart on the following pages.

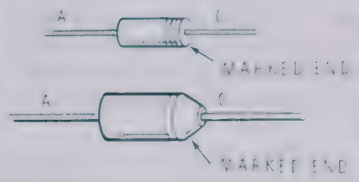
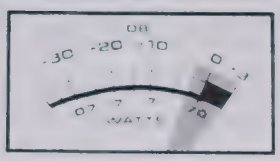
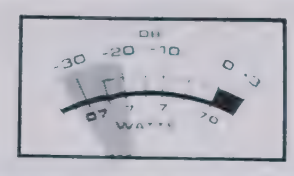
Connect the black meter lead to the other lead as directed in column #3 of the chart on the following pages.

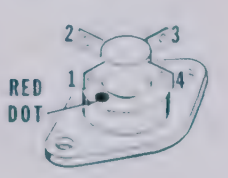
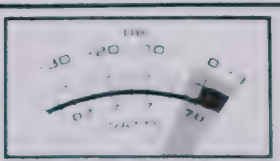
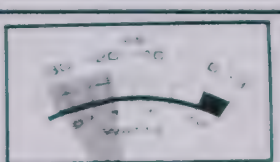
CHECKOUT CHART

If the meter reading indicates that a part is faulty, recheck the reading before you obtain a replacement part.

TRANSISTORS	CONNECT RED LEAD TO:	CONNECT BLACK LEAD TO:	METER READING
 MPSA20 (417-822)	B	C	
	B	E	
OR	E	C	
MPSL01 (417-811)	E	B	
	C	B	
SM07275 (417-283) WIDE SPACE			
 RCA1A16 (417-870)	B	C	
	B	E	
	E	C	
	E	B	
	C	B	
2N4121 (417-235)	B	C	
	B	E	
OR	E	C	
SM62186 (417-284) WIDE SPACE	E	B	
	C	B	

TRANSISTORS	CONNECT RED LEAD TO:	CONNECT BLACK LEAD TO:	METER READING
TZ582 (417-221)	B	C	
	B	E	
	E	C	
	E	B	
	C	B	
 RCA29C (417-868)	B	C	
	B	E	
	E	C	
	E	B	
	C	B	
 RCA30C (417-869)	B	C	
	B	E	
	E	C	
	E	B	
	C	B	
 MJ802 (417-254)	B	C	
	B	E	
	E	C	
	E	B	
	C	B	

DIODES	CONNECT RED LEAD TO:	CONNECT BLACK LEAD TO:	METER READING
1N4149 (56-56) 1N750A (56-59) MZ2360 (56-73) 17mA, 15V zener (56-620) 1N4002 (57-65) 	C	A	
	A	C	

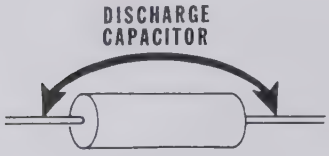
BRIDGE RECTIFIER	CONNECT RED LEAD TO:	CONNECT BLACK LEAD TO:	METER READING
10A20 (57-67) 	2	1	
	4		
	2	3	
	4		
	1	2	
		4	
	1	3	
	3	2	
		4	
	3	1	

HOW TO CHECK CAPACITORS

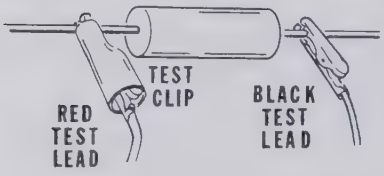
These instructions are divided into two groups. The first group is for capacitors of 50 μF and above. The second group is for capacitors below the value of 50 μF. Read steps A, B, and C; then proceed to the group of instructions for the value you intend to check.

A. Unsolder and remove the capacitor.

B. Discharge the capacitor by touching the leads together. (Note the special discharging instructions below for the 10,000 μF capacitors.)



C. Connect the black meter lead to one capacitor lead. Then, while you watch the meter, touch the red meter lead to the other capacitor lead. (Note the special instructions for the electrolytic capacitors.)



How to Discharge the 10,000 μF Capacitors

The 10,000 μF capacitors retain a very high charge and should be handled carefully. Never touch the lugs of the capacitor until you are sure it is discharged. Use the following method to discharge these capacitors.

Turn the Amplifier off and short the two lugs of the capacitor together with a 100 Ω, 2-watt resistor (see Page 69). Hold the resistor body in your fingers. Do not touch the resistor leads. Place the resistor between the lugs for several seconds, then remove it. Now short the two lugs together momentarily with the blade of a screwdriver. It is now safe to disconnect the wires and check the capacitor.

How to Connect the Test Meter to Electrolytic Capacitors

Each electrolytic capacitor has a positive (+) mark at one end. When you check one of these capacitors (using the test meter furnished), always connect the red Test Meter lead to the positive (+) capacitor terminal and the black Test Meter lead to the other terminal.

Checking Capacitors

Use the procedure in steps 1, 2, 3, and 4 for checking capacitors of 50 μF and higher capacity. Steps 5, 6, and 7 are for capacitors below the value of 50 μF. Read through the steps before you proceed with a check.

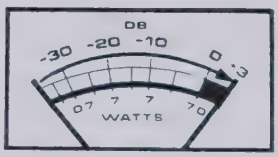
1. If the meter pointer deflects to the left side quickly, and then gradually returns to the right side, the capacitor **is not** faulty. NOTE: The time it takes for the pointer to return to the left side depends upon the value of the capacitor. A 50 μF capacitor for example, will cause the pointer to return more rapidly than a 500 μF capacitor.

2. If the meter pointer deflects to the left side and stays there, the capacitor **is** faulty (shorted).

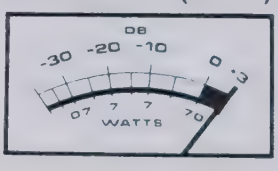
3. If the meter does not deflect at all, but stays at the right side, the capacitor **is** faulty (open).

4. Recheck the capacitor, BUT FIRST DISCHARGE IT BY TOUCHING THE LEADS TOGETHER.

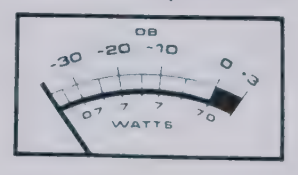
CAPACITOR OK

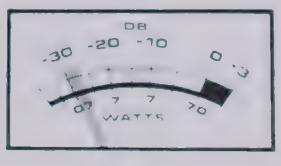


CAPACITOR (OPEN)



CAPACITOR (SHORTED)





The next three steps are for checking capacitors **below** the value of 50 μF.

Because of the small capacitance of these capacitors, it takes only a split second to charge them. Therefore, it is difficult to determine if the capacitor is faulty (open). Recheck the capacitor several times while watching the meter closely. Be sure to discharge the capacitor each time before you repeat the check.

5. If the meter pointer deflects **slightly** and remains at the right side, the capacitor **is not** faulty.

6. If the meter pointer does not deflect at all, but remains at the right side, the capacitor is faulty (open). NOTE: Disc capacitor values may be too low to register on the meter.

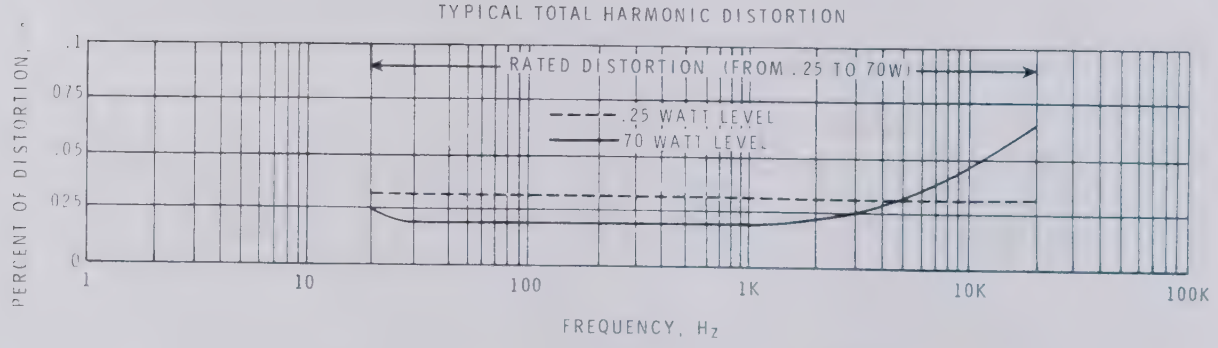
7. If the meter pointer deflects to the left side and stays there, the capacitor is faulty (shorted).

SPECIFICATIONS

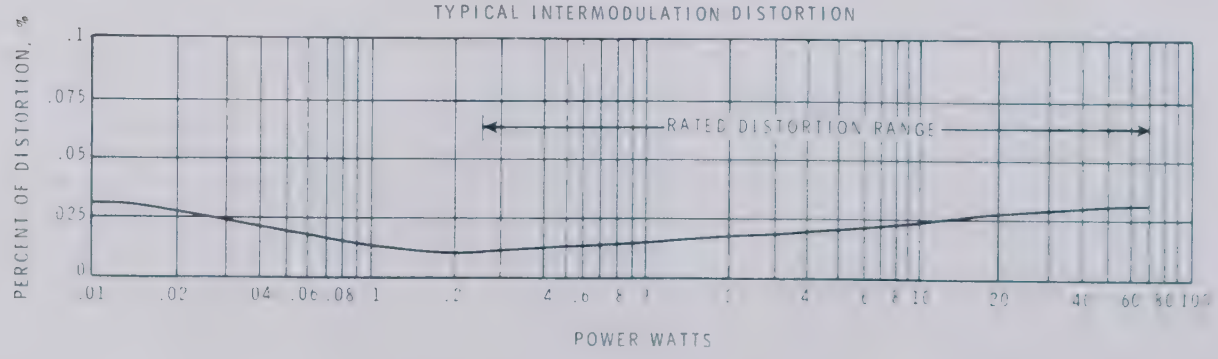
AMPLIFIER

NOTE: The following specifications are typical for both amplifier channels, with identical signals fed to both channels simultaneously. Left channel and right channel amplifiers both operating at equal power output into individual 8 ohms resistive load, line voltage constant at 120 volts AC.

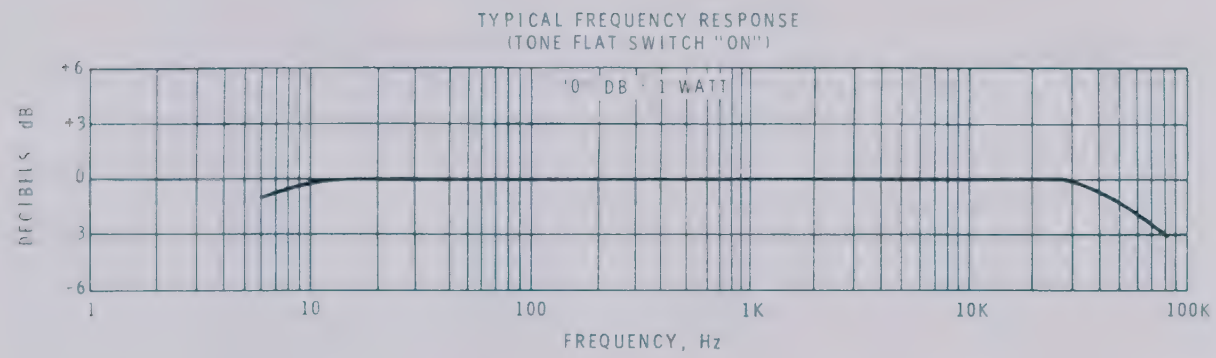
POWER OUTPUT ..... 70 WATTS MINUMUM RMS PER CHANNEL INTO 8 OHMS AT LESS THAN .08 PERCENT TOTAL HARMONIC DISTORTION FROM 20 TO 20,000 Hz.



Intermodulation Distortion ..... Less than .08 percent from .25 to 70 watts output, using 60 and 7,000 Hz mixed 4:1.



Frequency Response (1 watt level) ..... −1dB, 8 Hz to 45 kHz;
−3 dB, 4 Hz to 80 kHz.



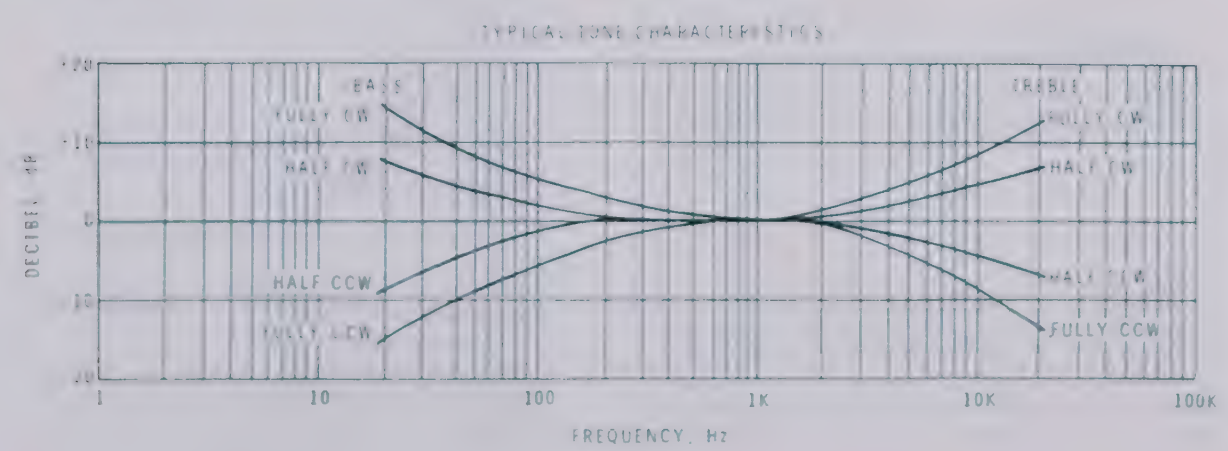
Tone Control

Bass boost ..... 13 dB @ 20 Hz.

Bass cut ..... 13 db @ 20 Hz.

Treble boost ..... 12 dB @ 20 kHz.

Treble cut ..... 12 dB @ 20 kHz.

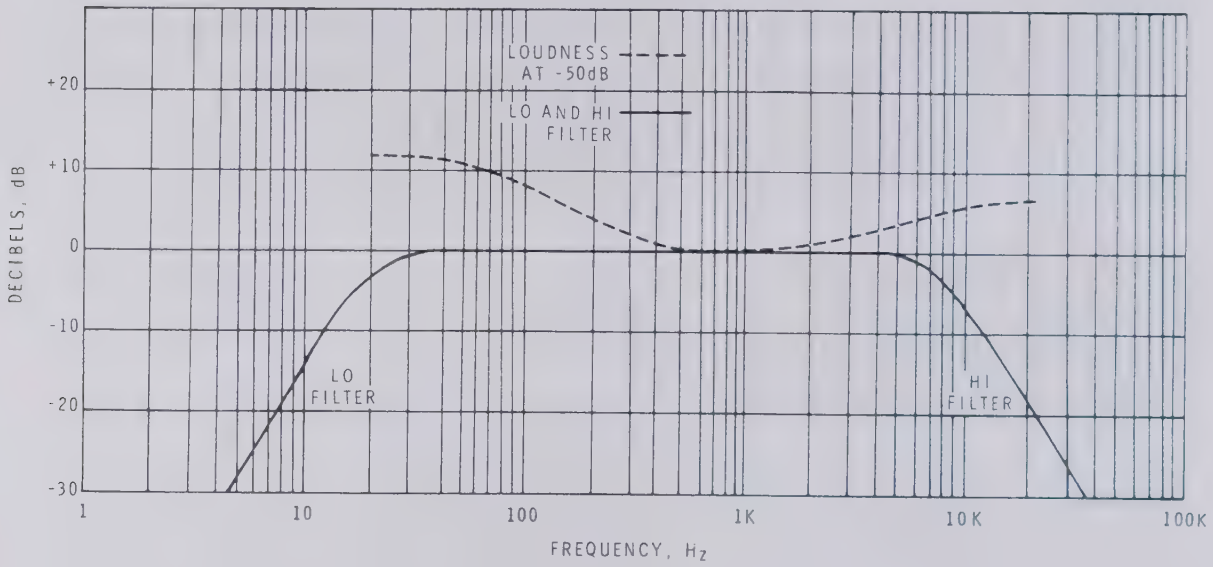


Filters

HI (low-pass)	7 kHz @ −3dB typical with 12 dB/octave slope.
LO (high-pass)	20 Hz @ −3 dB typical with 12 dB/octave slope.

Loudness Contour ..... See graph below.

TYPICAL FILTER AND LOUDNESS CHARACTERISTICS



Damping Factor ..... Greater than 60.

Input Sensitivity .....

NOTE: Input sensitivity is the rms input voltage needed to obtain 70 watts of output power per channel into 8 Ω loads.

Phono: 2 millivolts.
Aux: 150 millivolts.
Tuner: 150 millivolts.
Tape: 150 millivolts.
Tape Mon: 150 millivolts.
Tape Dub: 150 millivolts.

Input Overload .....

Phono: Greater than 100 millivolts.
Aux: Greater than 10 volts.
Tuner: Greater than 10 volts.
Tape: Greater than 10 volts.
Tape Mon: Greater than 10 volts.
Tape Dub: Greater than 10 volts.

Hum and Noise	
Unweighted	Phono: −65 dB min. (2 millivolt reference). Aux: −80 dB min. (150 millivolt reference). Tuner: −80 dB min (150 millivolt reference). Tape: −80 dB min. (150 millivolt reference). Tape Mon: −80 dB min. (150 millivolt reference). Tape Dub: −80 dB min. (150 millivolt reference). Volume control in minimum position: −100 dB referred to rated output.
"A" Weighted	Phono: −75 dB min. (2 millivolt reference). Aux: −90 dB (150 millivolt reference). Tuner: −90 dB (150 millivolt reference). Tape: −90 dB (150 millivolt reference). Tape Mon: −90 dB (150 millivolt reference). Tape Dub: −90 dB (150 millivolt reference). Volume control in minimum position: −110 dB referred to rated output.
Channel Separation	Phono: 55 dB min. (1 kΩ termination and 1 kHz). All high-level inputs: 60 dB min. (1 kΩ termination and 1 kHz).
Phono RIAA* equalization	± .5 dB (20 Hz to 20 kHz).
Cross Talk	
Hi-level to phono	60 dB min (1 kΩ termination and 1 kHz).
Phono to hi-level	85 dB min (1 kΩ termination and 1 kHz).
Tape Output Level	Equal to source (150 millivolt typical).
Tape Output Impedance	Source Impedance plus 4.7 kΩ.
Preamplifier Output Level	Variable, 0 to 1 volt rms typical. (Connect to 15 kΩ or greater.)
Preamplifier Output Impedance	Variable, 10 Ω to 6 kΩ typical.
Power Amplifier Input Level	1 volt rms needed for 70 watts.
Input Impedance	Phono: 47 kΩ ± 5 percent and 50 pF ± 10 percent. Aux: 90 kΩ ± 20 percent and 100 pF ± 10 percent. Tuner: 90 kΩ ± 20 percent and 100 pF ± 10 percent. Tape: 90 kΩ ± 20 percent and 100 pF ± 10 percent. Tape Mon: 90 kΩ ± 20 percent and 100 pF ± 10 percent. Tape Dub: 90 kΩ ± 20 percent and 100 pF ± 10 percent.
Power Amplifier Input Impedance	34 kΩ, ±5 percent.

*RIAA (Record Industry Association of America).

Headphone Output Impedance	270 Ω, ±10 percent.
Headphone Output Level	0 to .6 volts rms, 8 Ω; 0 to 20 volts rms, 2 kΩ.
Meter Circuit (Peak Responding)	
Attack Time (Time to indicate signal peak, 0 dB)	2 milliseconds (100 milliseconds meter dynamics) typical.
Decay Time (Time for signal to decay to −40 dB)	250 milliseconds typical.
Meter Indicating Response	−1 dB, 20 Hz to 20 kHz typical.
Meter Level Indicating Error	±1 dB (0 to −20 dB) typical. ±2 dB (−20 dB to −35 dB) typical.
Meter Indicating Range	40 dB.
Output Muting Turn-on Delay	Approximately 5 to 6 seconds.

GENERAL

Power Requirements	108 to 132 or 216 to 264 volts 50/60 AC. 60 watts idling (zero output) and 240 watts at rated output, with no load on accessory outlets.
AC Outlet Sockets	Two, located on back panel for powering accessory equipment. One switched, and one nonswitched (total of 360 watts for both).
Dimensions	Overall: 18-1/8" wide x 6-3/16" high x 15" deep (28.5 cm wide × 15.8 cm high × 38.1 cm deep).
Net Weight	30 lbs (13.6 kgs).

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

CIRCUIT DESCRIPTION

A number series has been assigned to the circuit components mounted on the different circuit boards and the chassis. These series numbers are referred to throughout the various sections of this Manual to help you identify the components and determine their location. These component numbers are grouped as follows:

1-49	Circuit components on the chassis.
50-99	Circuit components on the muting circuit board.
100-199	Circuit components on the preamplifier circuit board.
200-299	Circuit components on the tone circuit board.
400-499	Circuit components on the meter amplifier circuit board.
500-599	Circuit components on the power supply circuit board.
700-799	Circuit components on the output amplifier circuit board.

The left and right channels are identical. Therefore, only the left channel and the power supply will be described.

Refer to the Schematic (in the "Illustration Booklet") while you read this "Circuit Description."

PREAMPLIFIER CIRCUIT

The preamplifier circuit performs three basic functions. It selects the desired signal source, amplifies and equalizes the phono input signal, and further amplifies all of the input signals to a level sufficient to drive the remaining amplifier circuits. While most of the circuits and controls are mounted on the preamplifier and tone circuit boards, a few components are mounted on the chassis.

Selector switch SW101 can select any of five input terminals — Auxiliary, Tape, Tuner, Phono 1, and Phono 2. The input signal is coupled through switch deck SW101B and resistor R101 to the Tape Monitor switch, the Mode switch, and the Tape Out jack. When the TAPE MON switch pushbutton is pressed, a signal connected to the Tape Monitor jack is coupled to the Tape Dubbing switch. The TAPE MON switch also activates the front panel Tape Mon lamp. With the Tape Mon switch in its out (off) position, the preselected input signal is coupled to the TAPE DUBBING switch, and the Dub Out jack. This switch (located behind the front panel door) serves the same basic function as the Tape Mon switch. From the Tape Dubbing switch, the signal is coupled to the Input VOLLUME control (part of control R4).

The Volume control is unique in that it is composed of two sections per channel. The first section (Input Volume) attenuates the input signal before the preamplifier. The second section (Output Volume) attenuates the output of the preamplifier and tone circuits. This insures that the input signal does not overload the preamplifier and helps to attenuate any noise generated in the preamplifier at lower volume settings.

When the Loud switch is pressed in, capacitor C238 and resistor R265 are coupled to a tap on the Input Volume control. This boosts the low frequencies when the Input Volume control is at half rotation or less, to compensate for natural "tonal" hearing deficiencies at low volume levels. Similarly, capacitor C218 is coupled to the Output Volume control to boost the high frequencies at low volume levels. From the Input Volume control, the signal is coupled through capacitor C123 and resistor R126 to the preamplifier.

The preamplifier is basically an operational amplifier with feedback. The feedback circuit couples a portion of the output signal to the inverting input of the operational amplifier. This sets the overall gain of the circuit at approximately 17.9 dB. Two circuits comprise the preamplifier — a differential amplifier input stage, and an output amplifier. A differential amplifier is used because of its good common-mode rejection. The output amplifier provides a constant current output necessary to drive the various combinations of tone control and filter circuits (loads) that may be switched into the circuit.

The input signal is coupled to the base of transistor Q101. Q101 is the noninverting input of the differential amplifier formed by transistor Q101 and Q102. The signal is amplified by Q101 and coupled to the base of transistor Q104. The collector load for Q104 is a constant current source formed by transistor Q103 and resistors R133, R134, and R135. Voltage divider resistors R133 and R134 hold the base of Q103 at a constant voltage. This in turn biases the transistor to insure a constant current to the collector of Q104. From Q104, the amplified signal is coupled through capacitor C126 to the tone circuits. Resistors R131 and R132 couple a portion of the output signal back to the base of transistor Q102, to provide negative feedback to the differential amplifier.

When either Phono input is selected, the input signal is coupled to the phono amplifier (IC101) before the signal is routed through the switching circuits to the preamplifier. The phono amplifier is a very high gain, low noise, low distortion, dual channel, monolithic amplifier. It amplifies the signal from a magnetic phonograph cartridge to a suitable voltage level to drive the preamplifier circuit. A feedback circuit provides RIAA (Record Industry Association of America) equalization.

Phonograph output signals are coupled through the Left Phono 1 or 2 input jack, resistor R102 or R103, switch SW101A, and capacitor C101 to the input (pin 9) of phono amplifier IC101. The output (pin 13) of the phono amplifier is coupled through capacitor C106 and switch SW101B to the switching circuit and preamplifier. RIAA frequency compensation (AC feedback) is provided by resistors R108 and R112, and capacitors C103, C104, and C105. DC feedback is provided by resistors R109 and R113.

TONE CIRCUIT

The tone of an audio signal can be changed by amplifying or attenuating portions of it. This signal control is provided by an active filter circuit, and the base and treble circuits. Signals between 140 Hz and 4 kHz are not greatly affected by these circuits.

An active filter circuit is formed by a low frequency filter, a high frequency filter, and a 3-transistor complementary amplifier. Either of the filters, or both, or neither, can be selected. The low filter attenuates all frequencies below 20 Hz at a 12 dB/octave rate and the high filter attenuates all frequencies above 7 kHz at a 12 dB/octave rate. The filter amplifier and its feedback provide approximately unity gain. This, unlike most RC type filter circuits, prevents signal loss.

The preamplified signal is coupled through resistor R201 to the low filter circuit composed of resistors R203 and R204, and capacitors C201 and C202. If the Lo Filter switch is out (off), the low filter is bypassed. The signal is then coupled to the high filter circuit composed of resistors R205 and R206, and capacitors C203 and C204. If the Hi Filter switch is out (off) the high filter is bypassed. Resistor R203, and capacitor C203 provide a small amount of feedback to their respective filter circuits for a sharper turnover frequency slope.

The filtered (or unfiltered) signal is coupled to the base of transistor Q201, part of the complimentary output amplifier formed by transistors Q201, Q202, and Q203. Feedback, necessary to the active filter circuit, is coupled from the emitter of Q201 and the collector of Q203 to resistor R203 and capacitor C203. The collector load for Q203 is a constant current source formed by transistor Q202 and resistors R208, R209, and R211. Unity gain is assured by connecting the emitter of Q201 to the collector of Q203. Capacitor C206 couples the signal to the Tone Flat switch and the tone control circuits.

When the Tone Flat switch is pressed, the tone circuits are bypassed and the signal is coupled to the Volume control and the output amplifier circuits. With the Tone Flat switch out, the signal is coupled to the Bass and Treble controls for independent adjustment of the low and high frequency response. The bass and treble tone control circuit functions like an operational amplifier with an adjustable feedback circuit. Gain is determined primarily by the feedback.

Whe the Bass control is at the center of rotation, the gain is unity (one). As the control is turned toward the input signal, the feedback resistance is increased. This decreases the feedback signal, which increases the gain of the amplifier. Conversely, as the control is turned away from the input signal, the amplifier gain is decreased. At the low frequencies involved (less than 250 Hz), capacitors C212 and C213 across the control are virtually out of the circuit. However, above 250 Hz, these capacitors couple the input and feedback around the Bass control, to remove its effect from the circuit.

Capacitor C209 isolates Treble control R219 from the circuit at frequencies below 4 kHz. Above 4 kHz, C209 couples the input and feedback signals from the Treble control to the amplifier input. Gain in the treble circuit is also determined by the amount of feedback. But, in this circuit, it is a combination of the fixed base circuit feedback resistance of resistors R215, R216, R217, and R221, and the Treble control resistance. When the Treble control is at the center of rotation, the amplifier gain is unity. As the control is turned toward the input signal, the amplifier gain is increased. Conversely, amplifier gain is decreased when the control is turned in the opposite direction.

Capacitor C211 couples the signal to the base of transistor Q204 of differential amplifier Q204/Q205. The amplified signal is coupled to the base of transistor Q207. Q207 amplifies the signal and couples it through capacitor C217, the Tone Flat switch, the Output Volume control, and the Balance control to the rear panel Preamp Out connector. The output from Q207 is also coupled through capacitor C214 to the Bass and Treble controls for feedback. DC feedback is also supplied to the base of Q204 through resistor R222. The collector load for Q207 is a constant current source formed by transistor Q206 and resistors R226, R227, and R228.

Balance Control R232/R264 is a special dual control. When it is rotated clockwise from center, the left channel signal level is reduced without affecting the right channel signal level. Likewise, the right channel signal level is reduced without affecting the left channel signal level when the control is rotated counterclockwise from center.

OUTPUT AMPLIFIER

The signal is jumper-wired from the Preamp Out connector on the rear panel to the Pwr Amp In connector on the rear panel. From the Pwr Amp In connector, the signal is coupled through capacitor C701 and resistor R701 to the base of transistor Q701 of differential amplifier Q701/Q702. AC and DC feedback is supplied through resistors R704 and R711, and capacitor C703.

The signal from the collector of transistor Q701 is coupled directly through Q710 to the base of transistor Q704. Transistors Q704 and Q705 form a high gain complementary amplifier. From Q705, the amplified signal is coupled through capacitor Q708 and resistor R708 to the base of transistor Q711, and through diode D702 and resistor R716 to transistor Q709. Diode D702 and resistor R716 provide forward bias for transistors Q709 and Q711. This in turn provides bias for output transistors Q710 and Q712 so that class AB operation is maintained.

Transistor Q703 is used as a current source for transistors Q701 and Q702. Transistor Q706 provides current to saturate driver transistor Q709 and output transistor Q710 on the maximum positive signal swing. Resistors R731 and R732 provide DC stabilization for output transistors Q710 and Q712. Coil L701, resistors R733 and R734, and capacitor C723 insure stable amplifier operation under all load conditions. The output of the amplifier is coupled to the Speakers switch and the meter amplifier.

The Speakers 1 and 2 switch couples the amplified audio signal to their respective rear panel speaker terminals, when the switches are pushed in. Regardless of switch position, the signal is coupled to the headphone jack through resistor R267.

A power dissipation limiting circuit, consisting of transistors Q707 and Q708 and their associated circuitry, protects the amplifier against overdissipation that could destroy the output transistors. Only one-half of this circuit will be described, since the other half operates in the same manner, except on the other half cycle.

Under normal operation, transistor Q707 is turned off. If the output of the amplifier should become shorted, the emitter of Q707 is fixed at a ground potential. Due to the drive being applied to the amplifier, the current through resistor R731 increases. This makes the base of transistor Q707 positive with respect to the emitter, and turns the transistor on. With Q707 conducting, the signal at the base of transistor Q709 is coupled to ground and the output power of the amplifier is limited to a safe level.

The values of resistors R718, R728, and R731 are selected to give the desired amount of limiting. Diode D705 prevents transistor Q707 from being forward biased by the negative half of the output signal swing. Capacitor C712 and the combination of capacitor C715 and resistor R727 provide stability during limiting.

METER AMPLIFIER

The signal coupled to the meter amplifier is reduced in level by divider resistors R401 and R402 and coupled through capacitor C401 and resistor R403 to the base of transistor Q401. The amplified signal from Q401 is coupled to the base of transistor Q402. These two transistors, along with the two non-linear feedback diodes (D401 and D402), form a 40 dB logarithmic amplifier. This amplifier allows a very large signal range to be displayed on the meter.

The amplified signal from transistor Q402 is coupled through half-wave doubler rectifier diodes D403 and D404, and filter capacitor C404 to the Darlington amplifier composed of transistors Q403 and Q404. A Darlington configuration is used to reduce rectifier loading so that an accurate peak representation of the output signal is coupled to the meter through resistor R412. Transistor Q405, resistor R411, and capacitor C405 comprise a 4 to 5-second delay circuit to hold Q404 off at initial turn-on. This reduces the chance of any transient voltages reaching the meter.

POWER SUPPLY

The transformer operated power supply contains two bridge rectifiers and one full-wave rectifier, which furnish the various voltages to the Amplifier.

Two AC receptacles are provided on the rear of the chassis to furnish switched and unswitched power for other equipment. Line voltage is present at the unswitched receptacle whenever the line cord plug is connected to an AC source. Line voltage is present at the switched receptacle only when the Power switch is pressed in.

Line voltage passes through fuse F1 to the dual primary winding of the power transformer. Two primary windings are connected in parallel for 120-volt operation and in series for 240-volt operation.

The secondary windings on the power transformer step down the line voltage to the required voltage levels. One winding supplies voltage to bridge rectifier BR1, which produces a +46 volts DC and a −46 volts DC. The +46volts DC is filtered by capacitor C2 and coupled to the output amplifier circuits. The −46 volts DC is filtered by capacitor C3 and coupled to the output amplifier circuits

Another secondary winding supplies voltage to the bridge rectifier consisting of diodes D501, D502, D503, and D504. Diodes D502 and D504 produce the +32 volts that is filtered by capacitor C505 and coupled to the preamplfier, tone, and meter circuits. Diodes D501 and D503 produce the −32 volts DC that is filtered by capacitor C506 and coupled to the preamplifier and tone circuits. The capacitors C501, C502, C503, and C504 across the rectifier diodes suppress any high frequency radiation that may be generated.

The remaining secondary winding of the power transformer is coupled to the full-wave rectifier circuit consisting of diodes D505 and D506, and capacitor C509. The +9 volts DC produced is used for the panel lights.

TEST CIRCUIT

When the Meter switch is in the Test position, the right meter is disconnected from the meter circuit and connected to the test circuit. With the Function switch in the Norm/V position, a voltage applied to the red test lead is coupled through current limiting resistors R1 and R3 to the meter. The resistor values are selected to produce a meter pointer deflection proportional to the applied voltage.

With the Function switch in the R (ohmmeter) position, 9 volts AC is connected in series with diode D1, resistor R2, and the meter. This causes a current to flow and deflect the meter pointer full scale. If the red test lead is connected to a resistance test point, a portion of the meter current is diverted through the test point, and the meter gives a lower indication.

MUTING CIRCUITS

The muting circuits open circuit the speaker terminals before, and for a brief period after (about 5 seconds), the power is turned on. This keeps any voltage transients that may be generated as the Amplifier turns on from reaching your speakers. Even a small voltage transient, when amplified by the power amplifier, could damage the speakers.

The muting circuit consists of a relay, a relay driver circuit, and a timing circuit. The relay, RY51, is normally de-energized when the power is turned off. When the POWER pushbutton is pressed, power (9 to 10 volts) is applied to the muting circuits. Since capacitor C51 momentarily holds (for about 5 seconds) the base of transistor Q51 near ground potential, Q51 remains off. However, after capacitor C51 charges sufficiently (for about 5 seconds) through resistor R51, Q51 turns on. As Q51 turns on, transistors Q52 and Q53 also turn on to energize relay RY51. When the relay energizes, it closes the circuit power amplifier from the output and allows the audio signal to reach the speaker terminals.

The relay remains energized as long as the power is turned on. However, when the power is turned off, the relay de-energizes, again open circuiting speaker terminals. Diode D51 now becomes forward biased and quickly discharges capacitor C51. This rapid discharge of C51 insures that the muting circuits will function even if power is only momentarily turned off and back on.

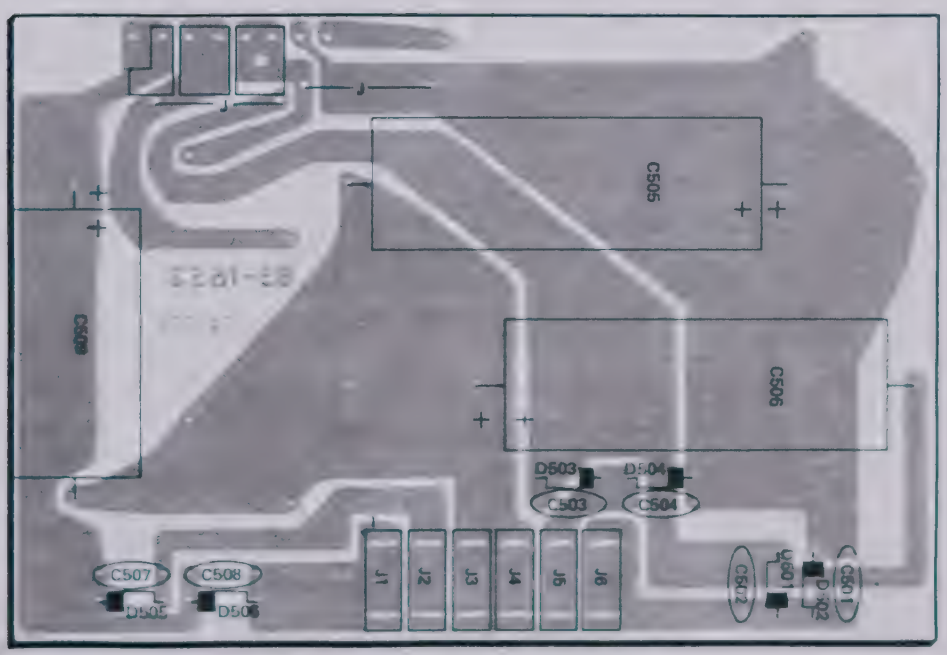
CIRCUIT BOARD X-RAY VIEWS

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R5, C3, etc.) on the X-Ray View.

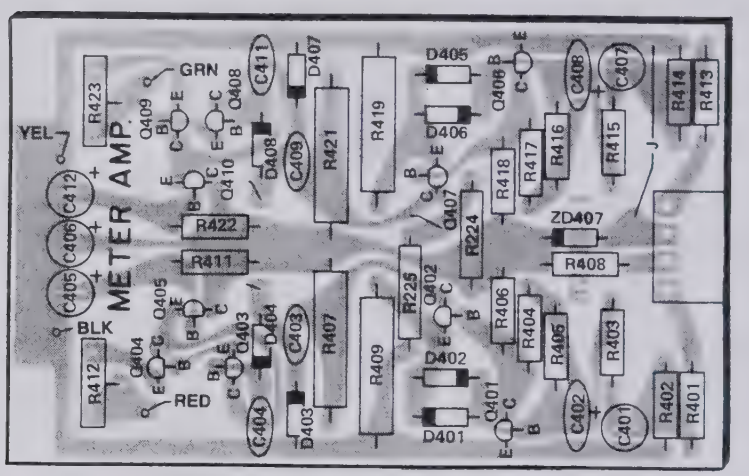
B. Locate this same number in the "Circuit Component Number" column of the "Parts List" in the front of this Manual.

C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



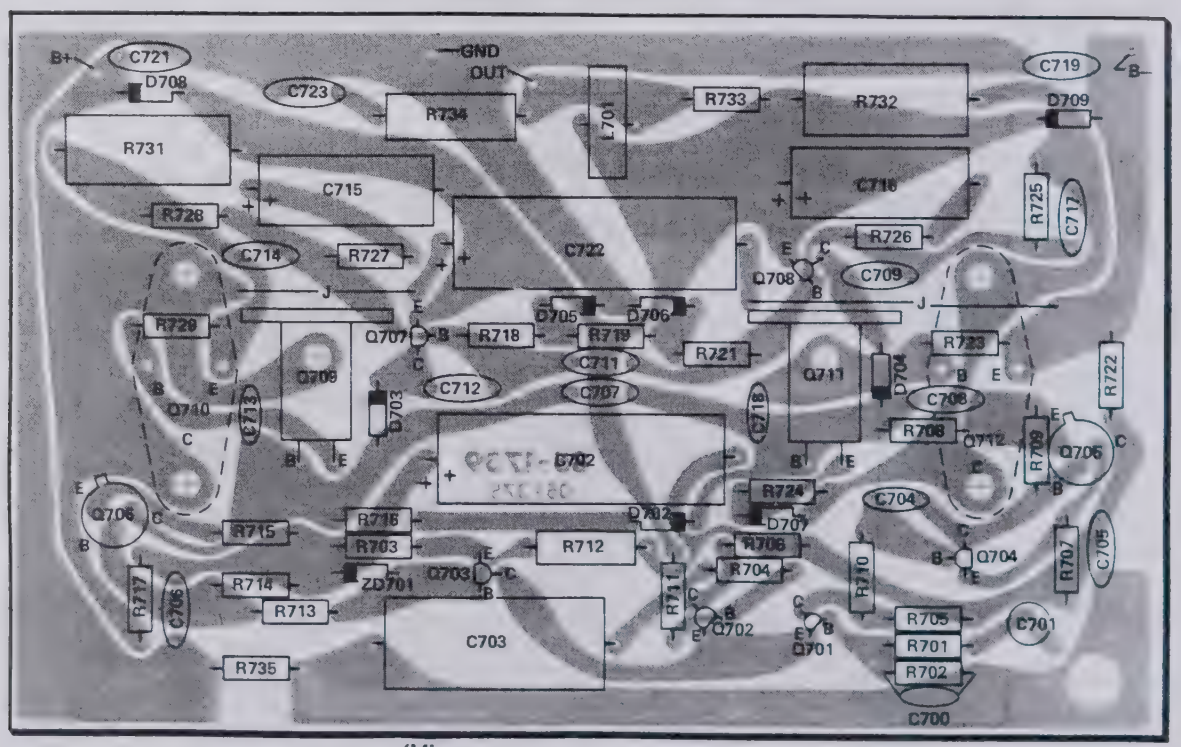
POWER SUPPLY CIRCUIT BOARD
(Viewed from component side)

METER AMPLIFIER CIRCUIT BOARD



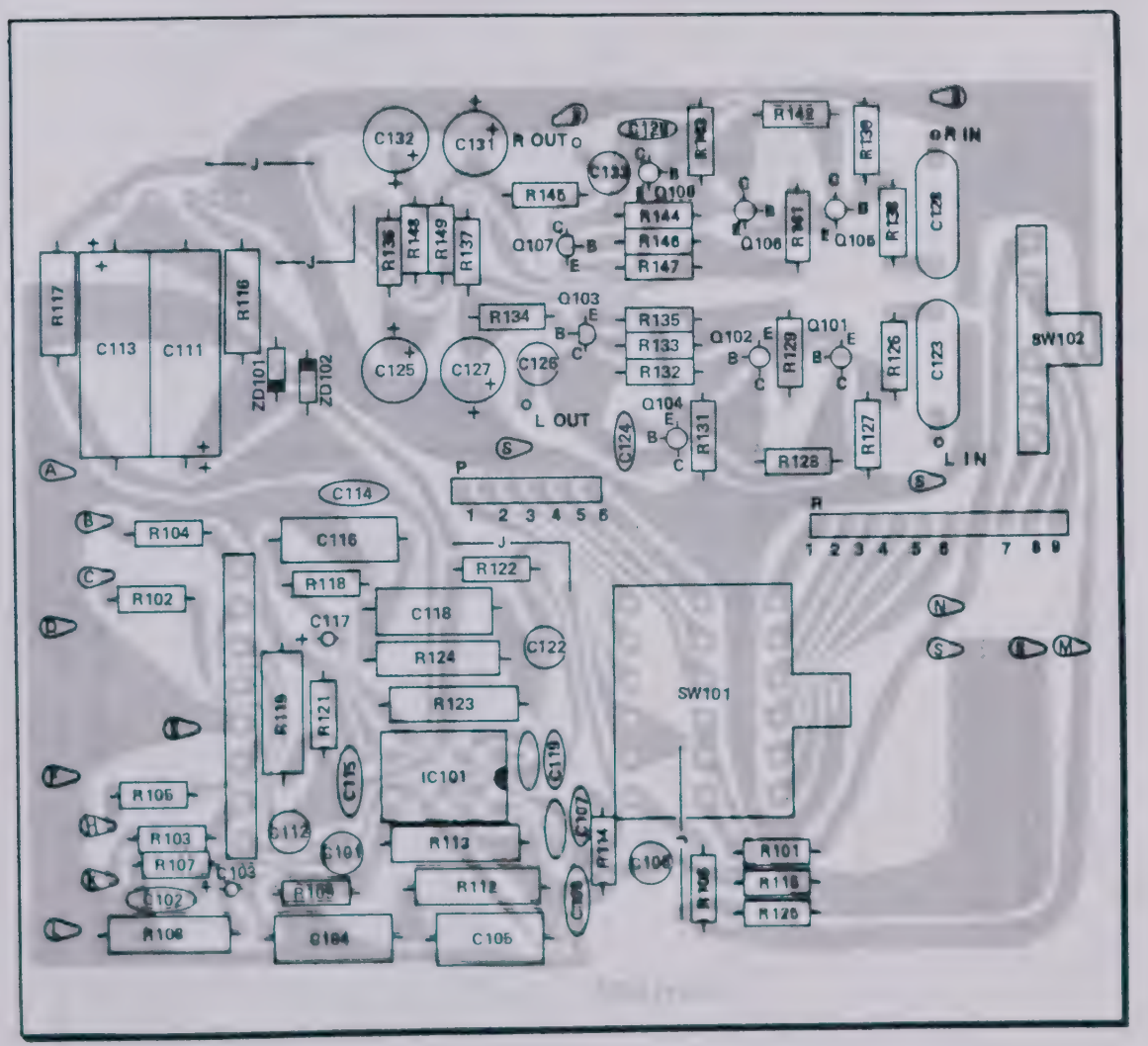
(Viewed from component side)

OUTPUT AMPLIFIER CIRCUIT BOARD



(Viewed from component side)

PREAMPLIFER CIRCUIT BOARD



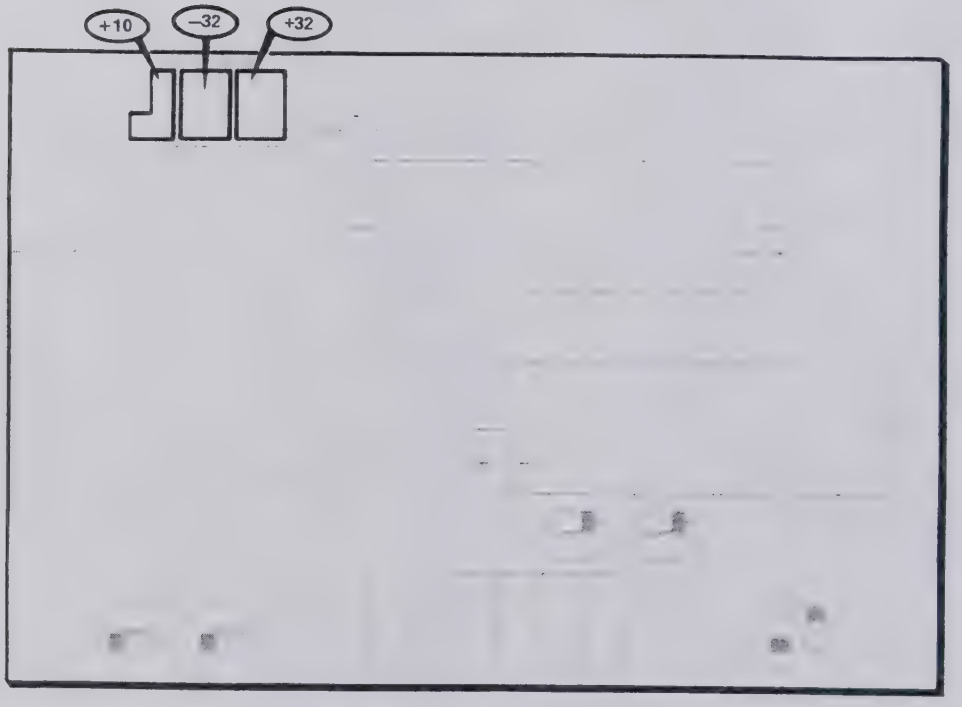
(Viewed from component side)

TONE CIRCUIT BOARD
(See "Illustration Booklet")

CIRCUIT BOARD VOLTAGE CHARTS

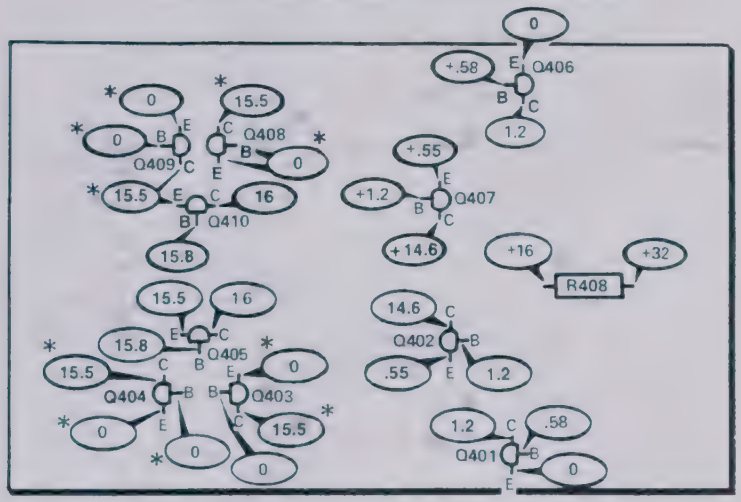
NOTE: All voltages are DC. Voltage measurements were taken with a high input impedance voltmeter from the point indicated to chassis ground. Voltages may vary ± 20 percent.

POWER SUPPLY CIRCUIT BOARD



(Viewed from component side)

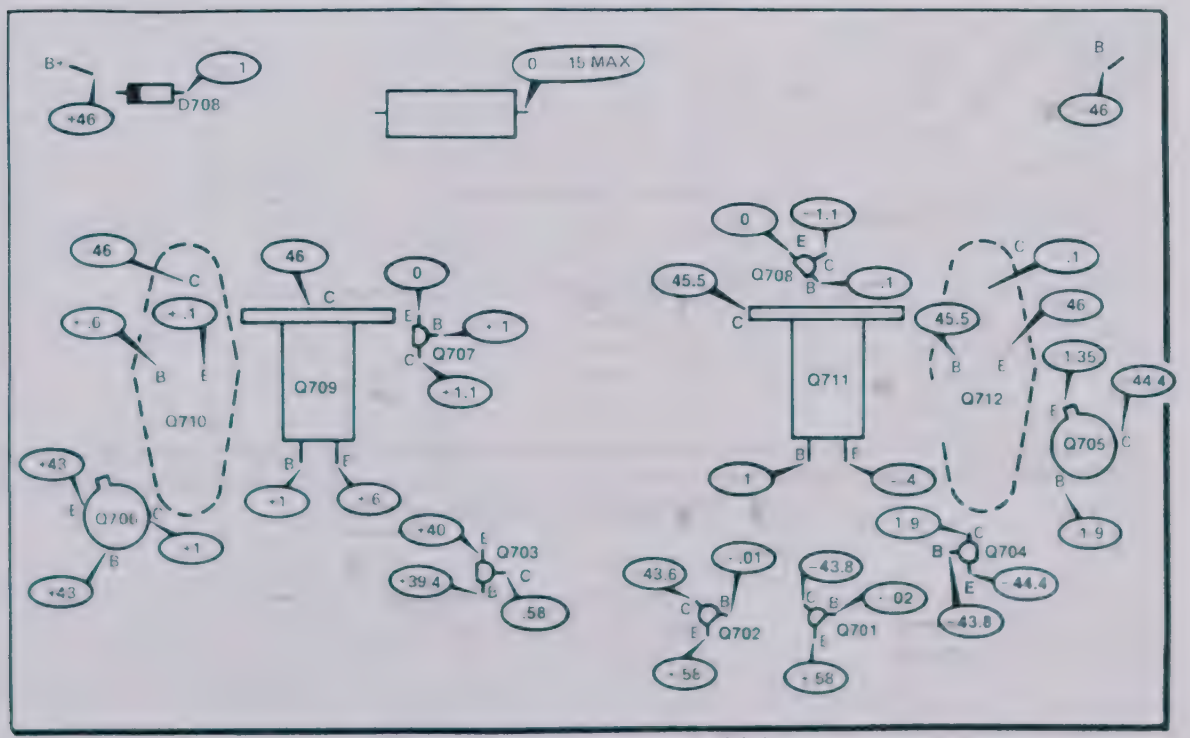
METER AMPLIFIER CIRCUIT BOARD



(Viewed from component side)

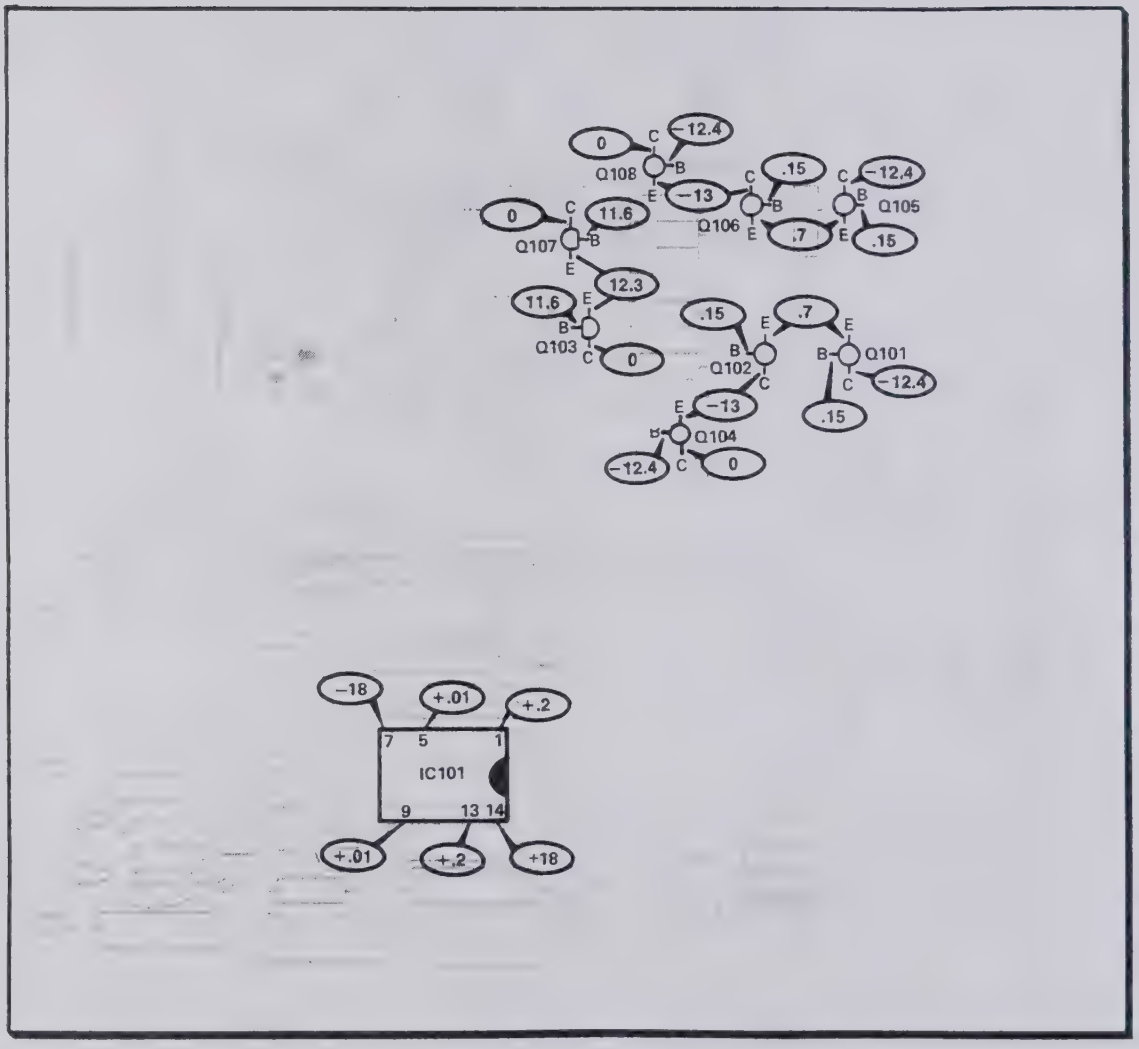
✱ VOLTAGES WITH NO INPUT SIGNAL

OUTPUT AMPLIFIER CIRCUIT BOARD



(Viewed from component side)

PREAMPLIFIER CIRCUIT BOARD

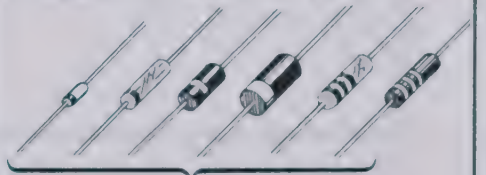


(Viewed from component side)

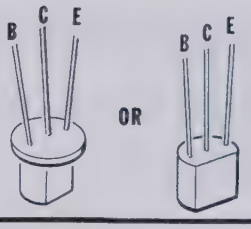
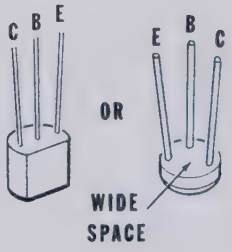
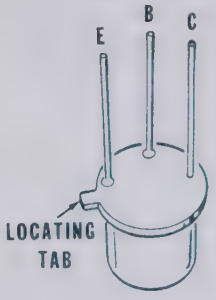
TONE CIRCUIT BOARD
(See "Illustration Booklet")

SEMICONDUCTOR IDENTIFICATION CHARTS

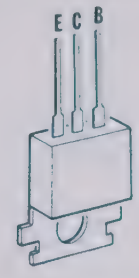
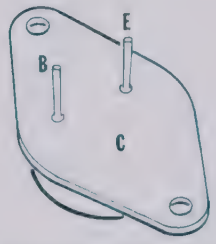
DIODES

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	LEAD DIAGRAM
D1, D51, D401, D402, D403, D404, D405, D406, D407, D408, ZD701	56-56	1N4149	IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.  BANDED END
D703, D704, D705, D706, D707	56-59	1N750A	
D702	56-73	MZ2360	
ZD101, ZD102	56-74	MZ2362	
ZD407	56-620	15-volt zener	
D52, D501, D502, D503, D504, D505, D506	56-36	16.1-volt zener	
	57-65	1N4002	
BR1	57-67	10A20	

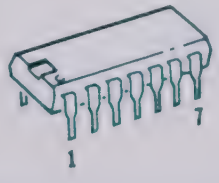
TRANSISTORS

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	BASE DIAGRAM
Q701, Q702, Q703, Q708	417-221	TZ582	
Q51, Q52, Q53, Q401, Q402, Q405, Q406, Q407, Q410, Q707	417-801	MPSA20	
Q403, Q404, Q408, Q409	417-882	MPSA20 (Selected)	
Q704	417-811	MPSL01	
Q103, Q107, Q202, Q206, Q207, Q209, Q213	417-235	2N4121	
Q104, Q108, Q203, Q207, Q210, Q214	417-283	SMO7275	
Q101, Q102, Q105, Q106, Q201, Q204, Q205, Q208, Q211, Q212	417-284	SM62186	
Q705, Q706	417-870	RCA1A16	

Transistors (cont'd.)

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	BASE DIAGRAM
Q709	417-868	RCA29C	
Q711	417-869	RCA30C	
Q710, Q712	417-254	MJ802	

INTEGRATED CIRCUIT

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	LEAD DIAGRAM
IC101	442-615	UA739 (selected)	

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this form. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DOTTED LINE

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

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CITY _____

STATE _____ ZIP _____

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TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish Be sure to tell us:

- The Model number and Series number from the blue and white label
- The date of purchase
- An exact description of the difficulty
- Everything you have done in attempting to correct the problem

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

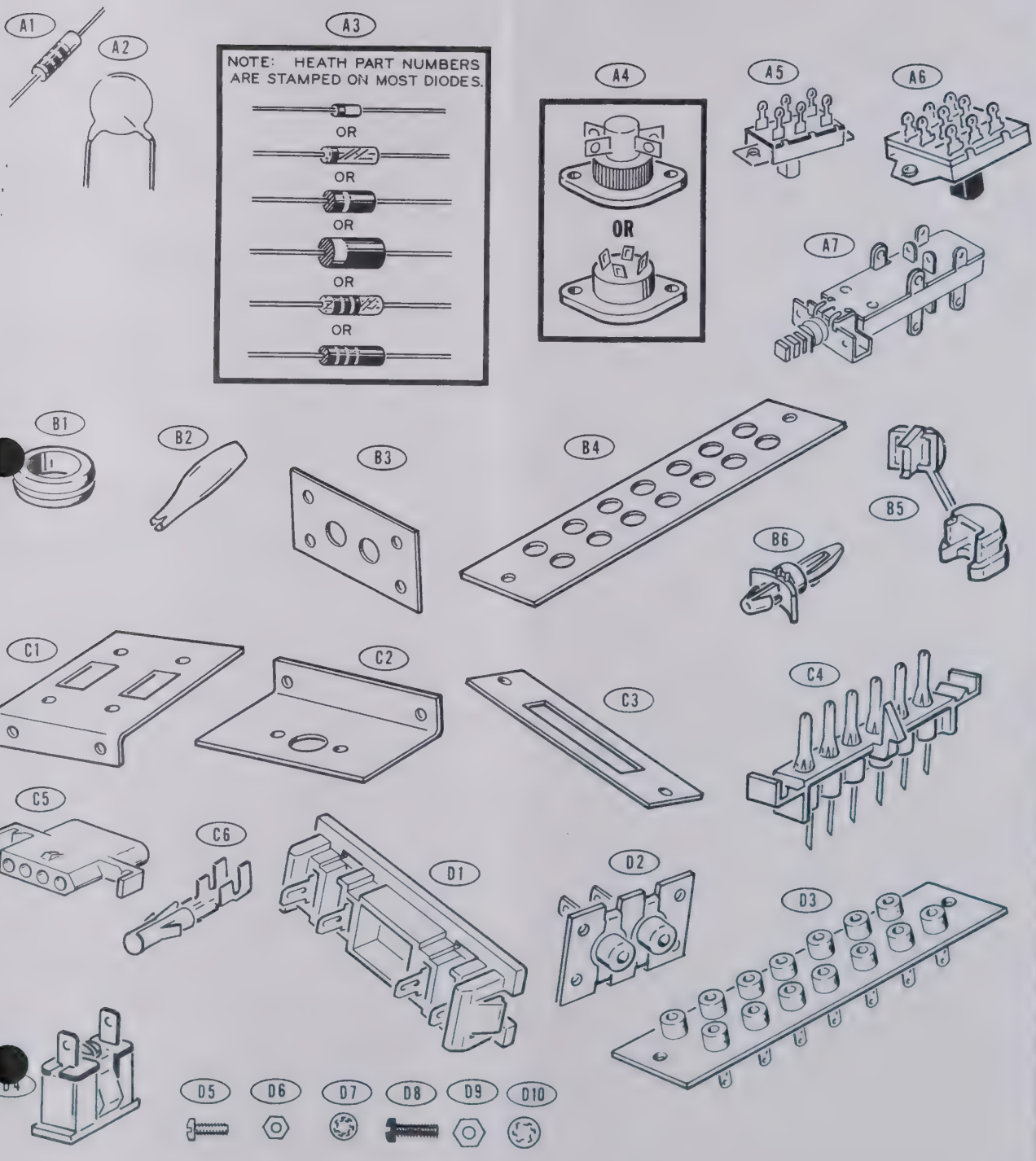
ZENITH

HEATH COMPANY • BENTON HARBOR MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

ILLUSTRATIO

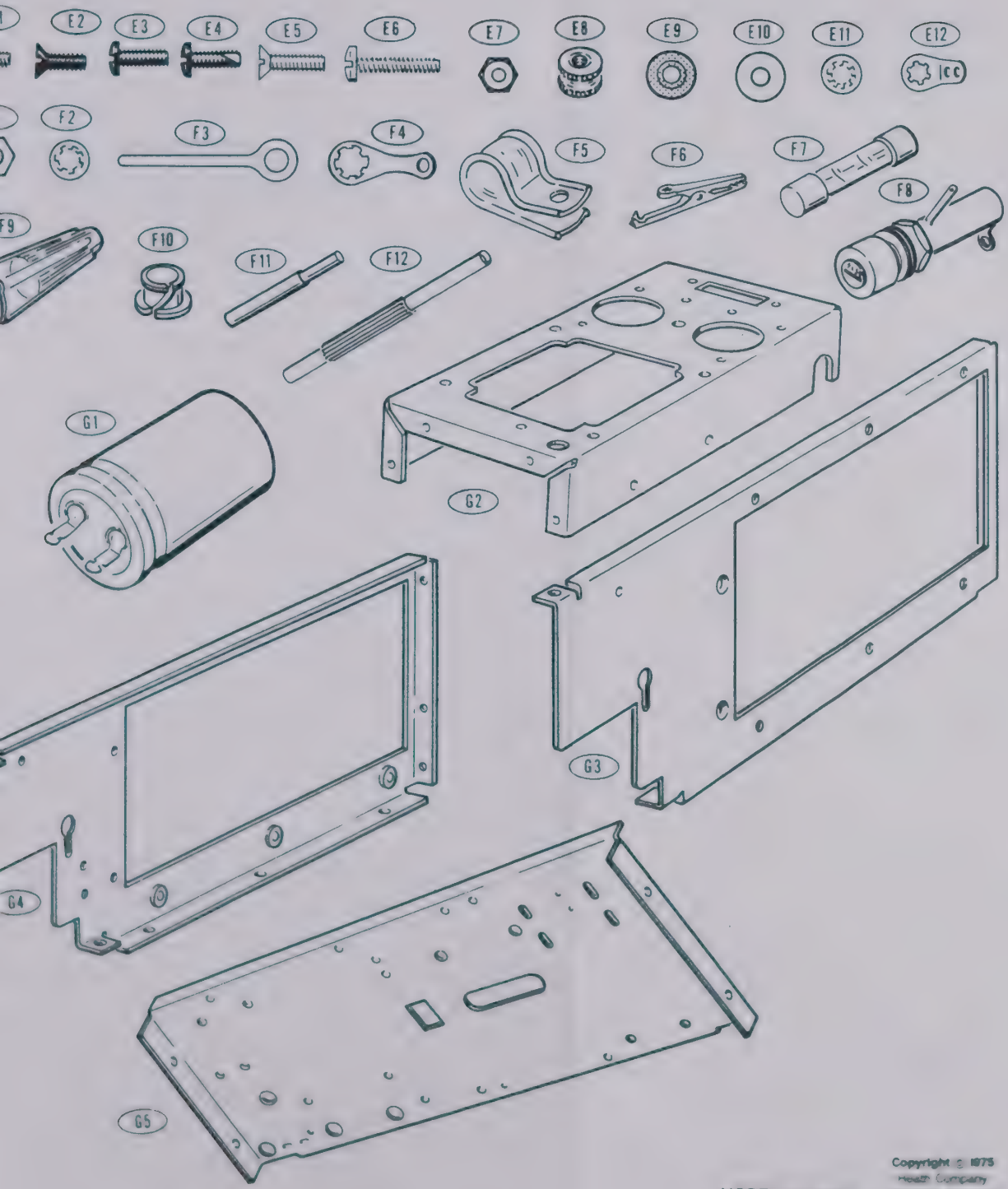
PARTS PIC



BOOKLET

Part of 595-1815-04

ORIAL



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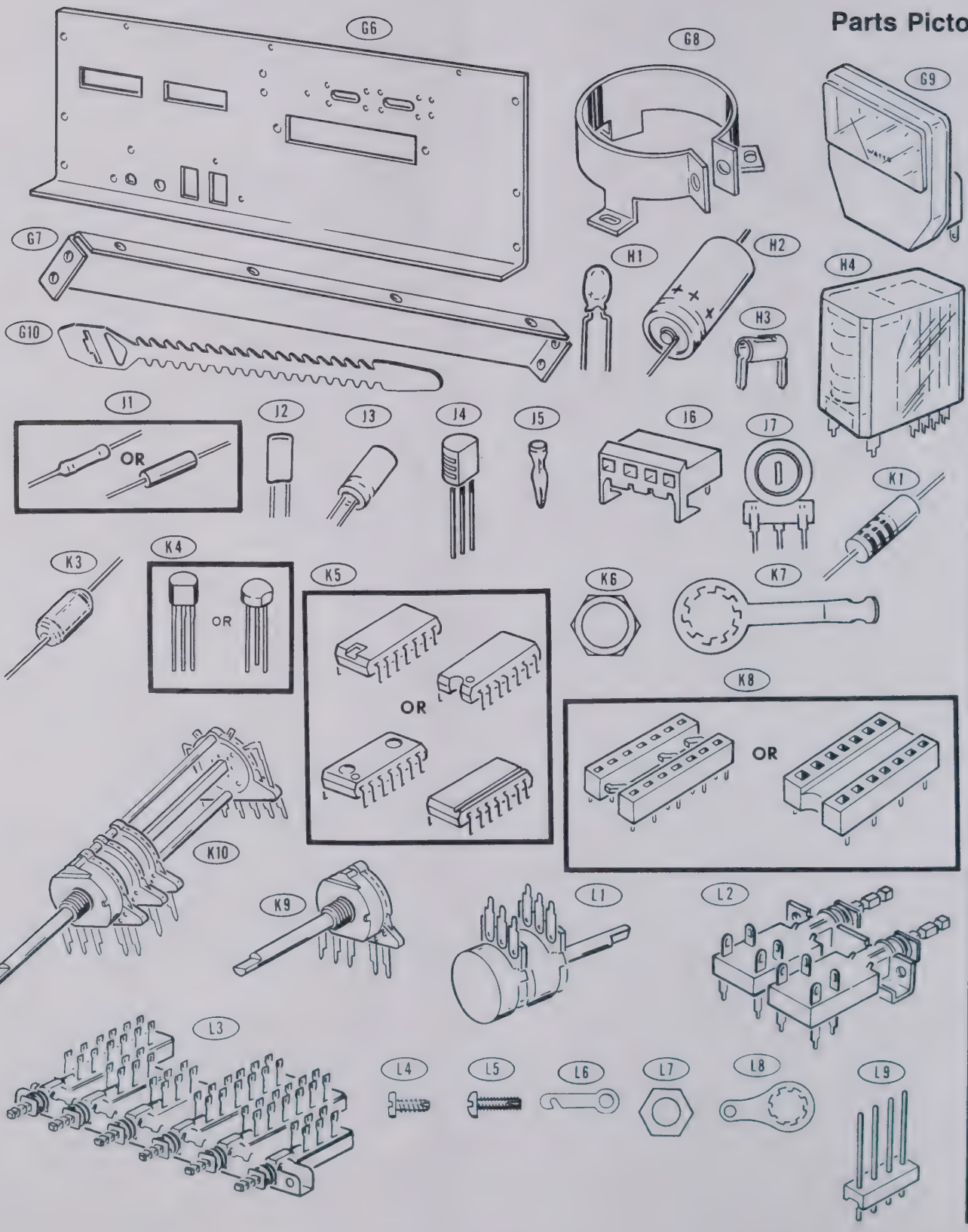
MODEL AA-1515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G8
G9
G7
H1
H2
H4
G10
H3
J1
OR
J2
J3
J4
J5
J6
J7
K1
K3
K4
OR
K5
OR
K6
K7
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L9

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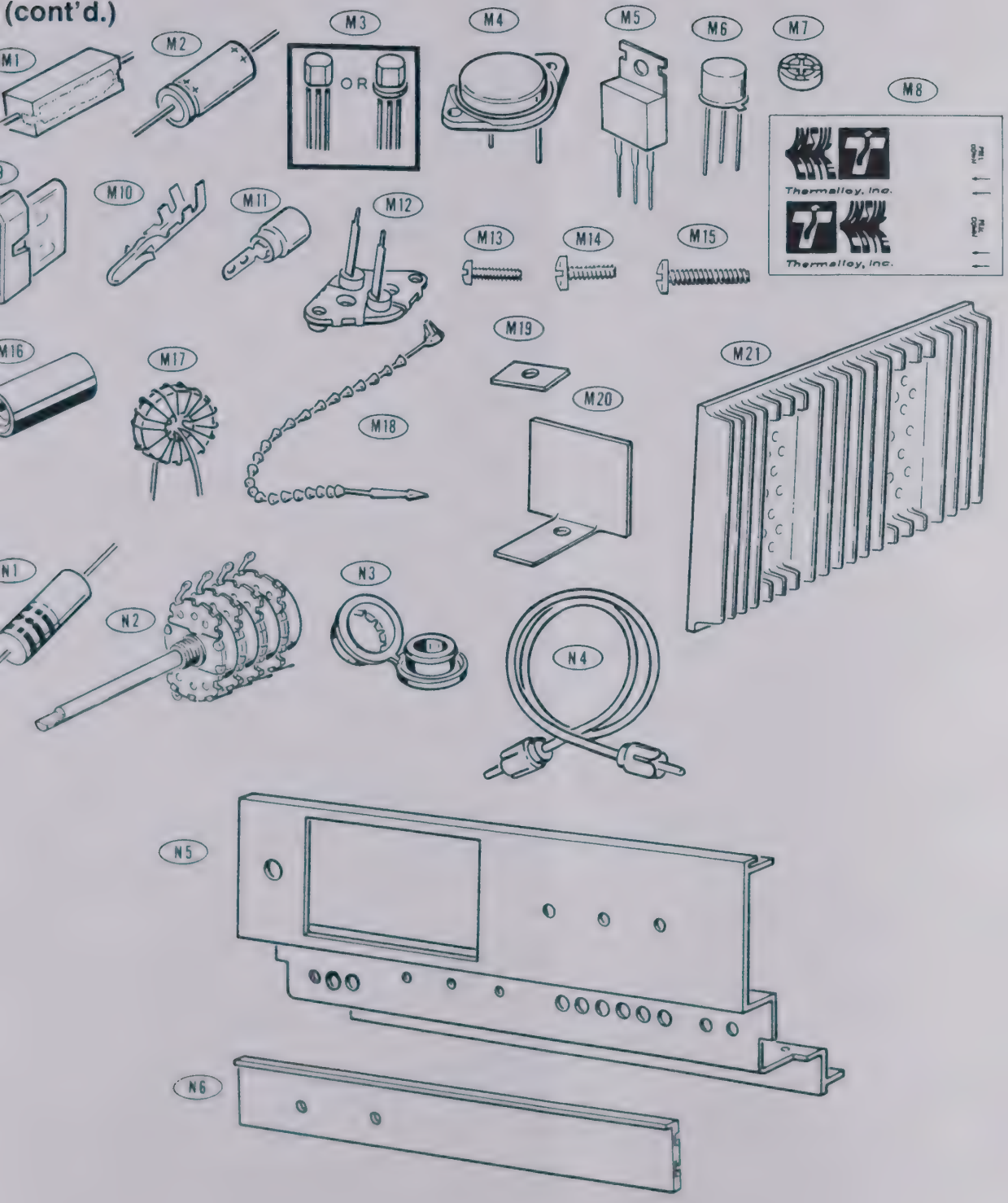
M1
M2
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OR
M4
M5
M6
M7
M8
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Thermalloy, Inc.
M10
M11
M12
M13
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M15
M16
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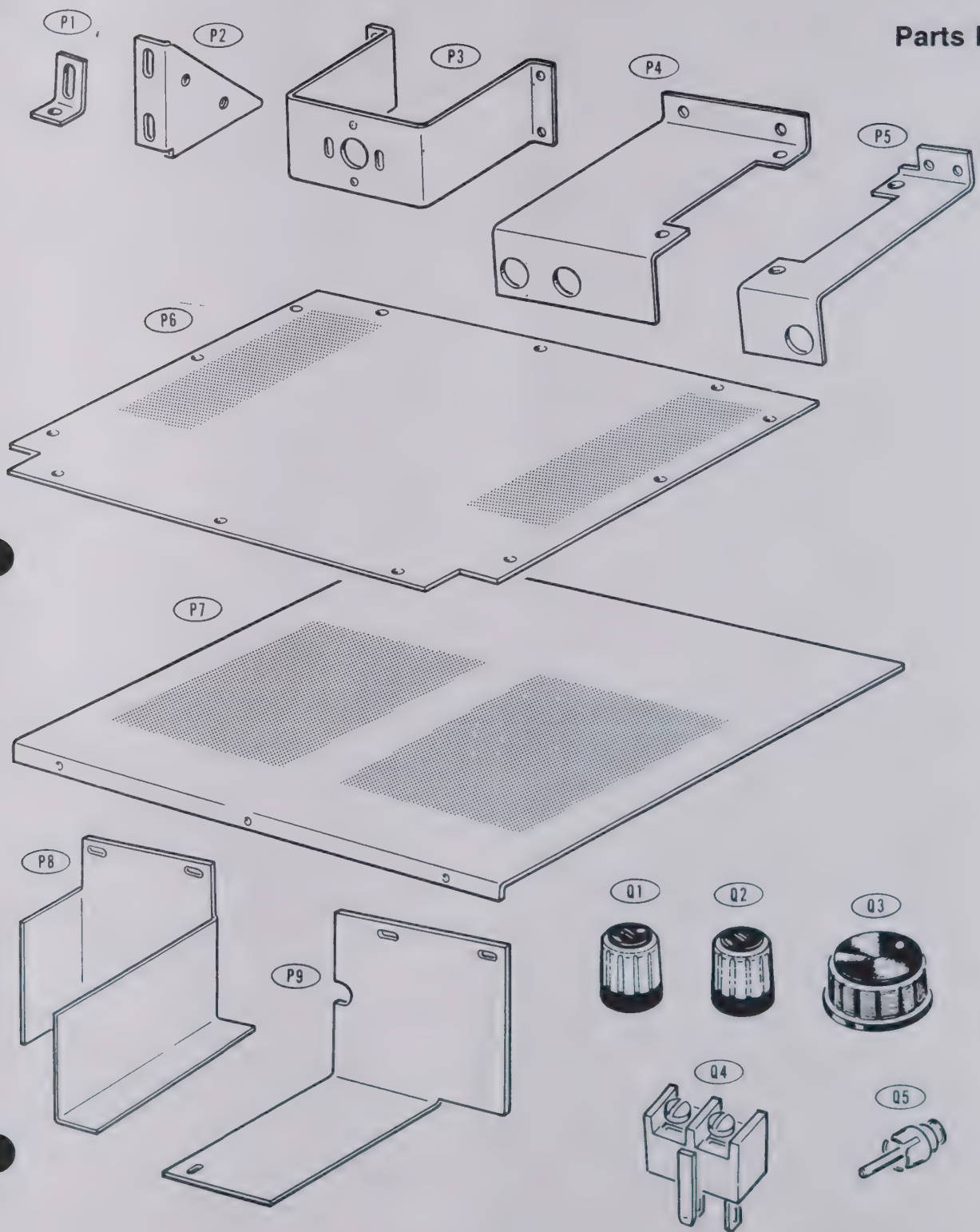
N5
N6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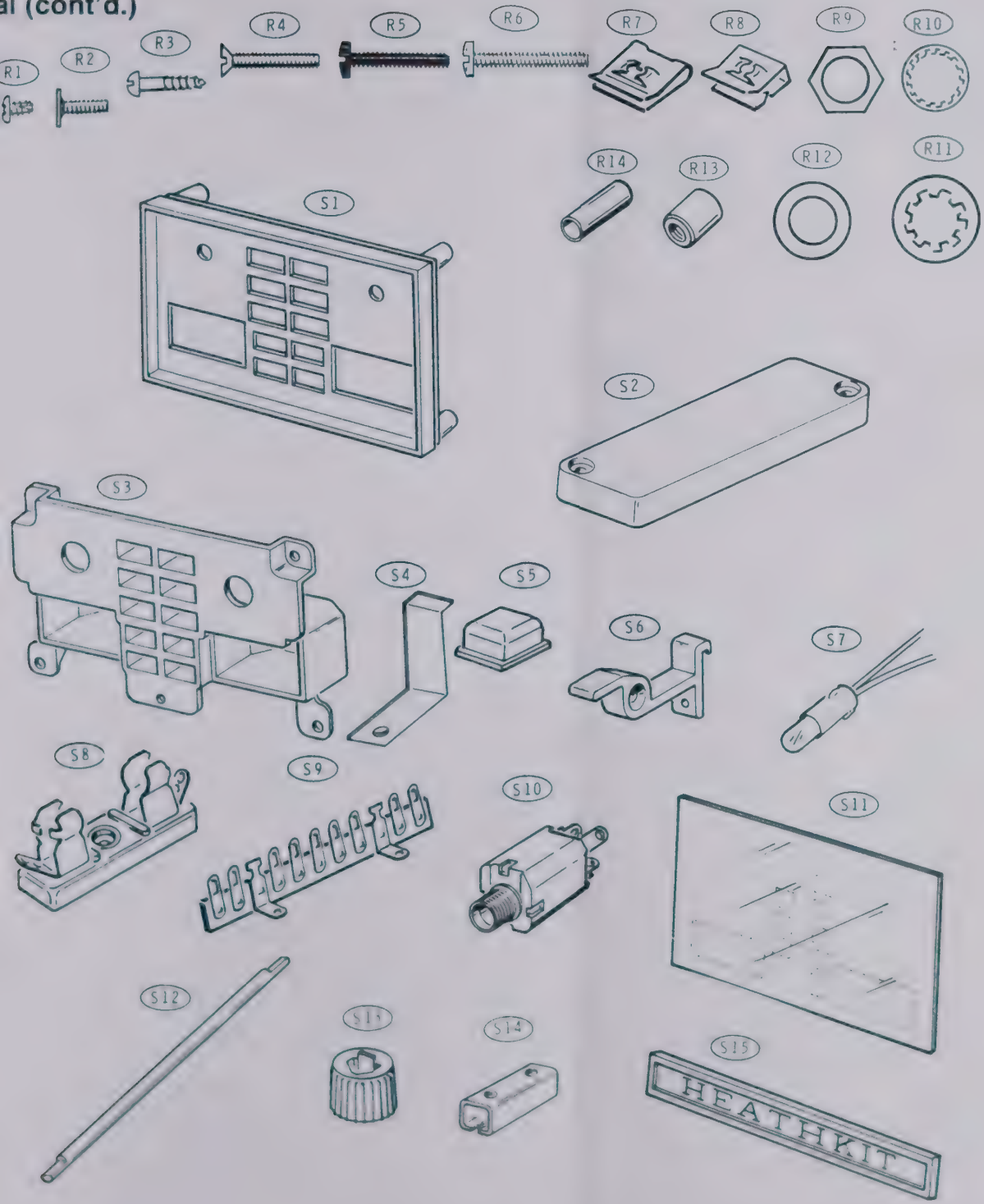
Q5

al (cont'd.)


R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
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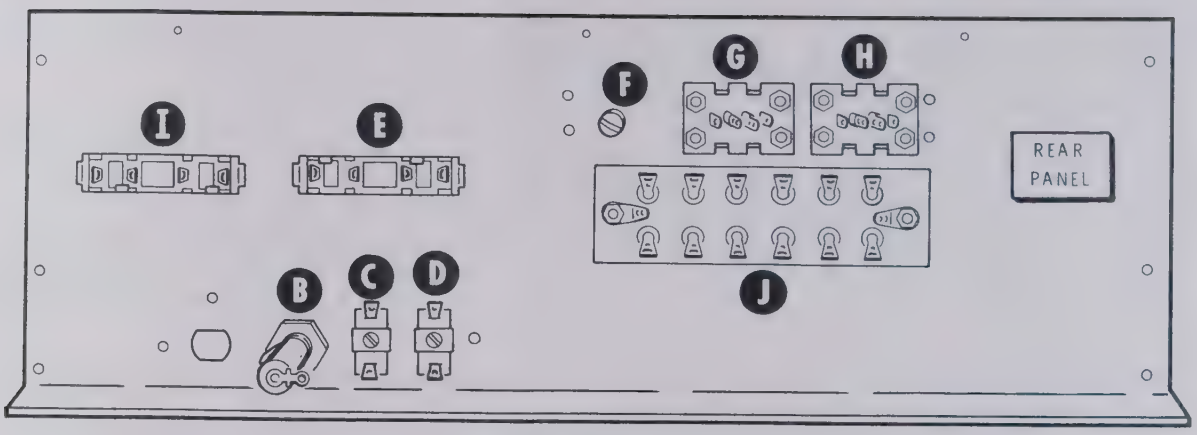
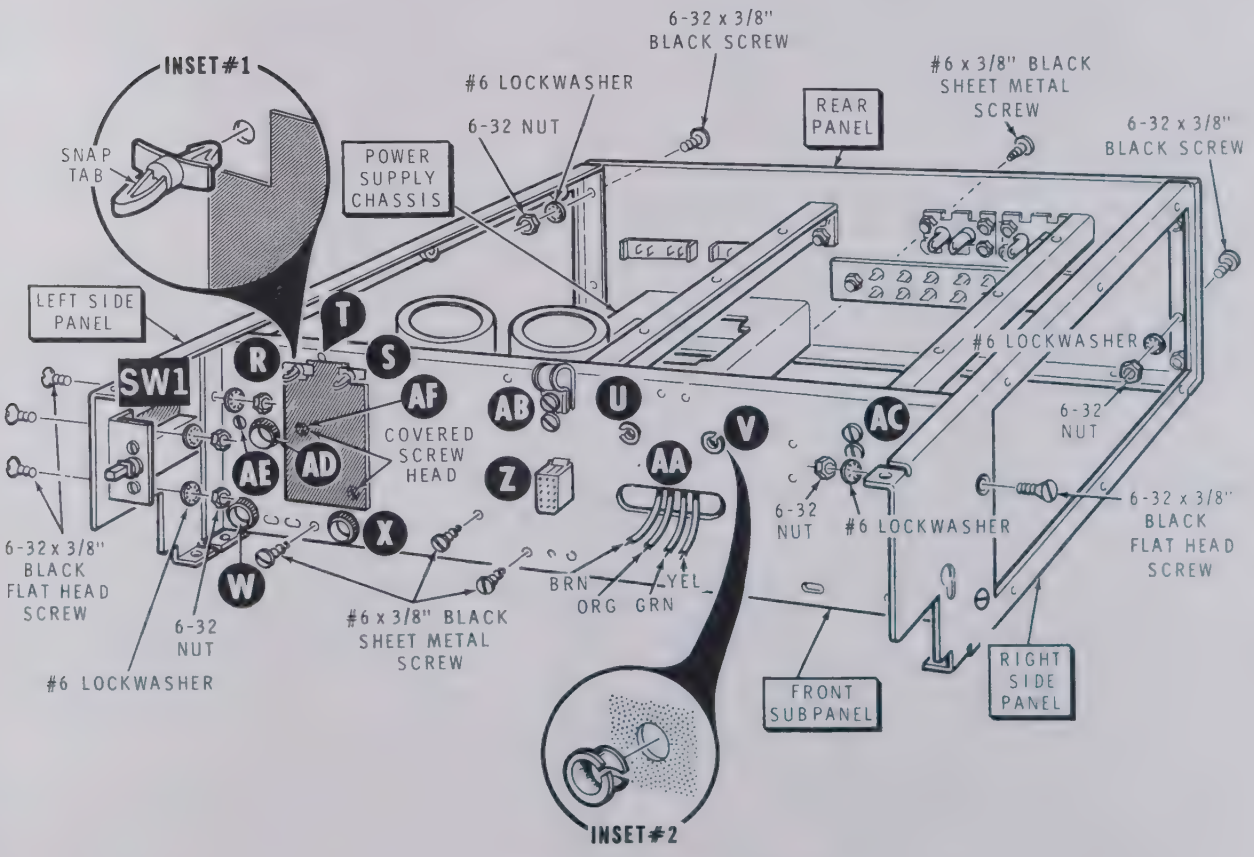
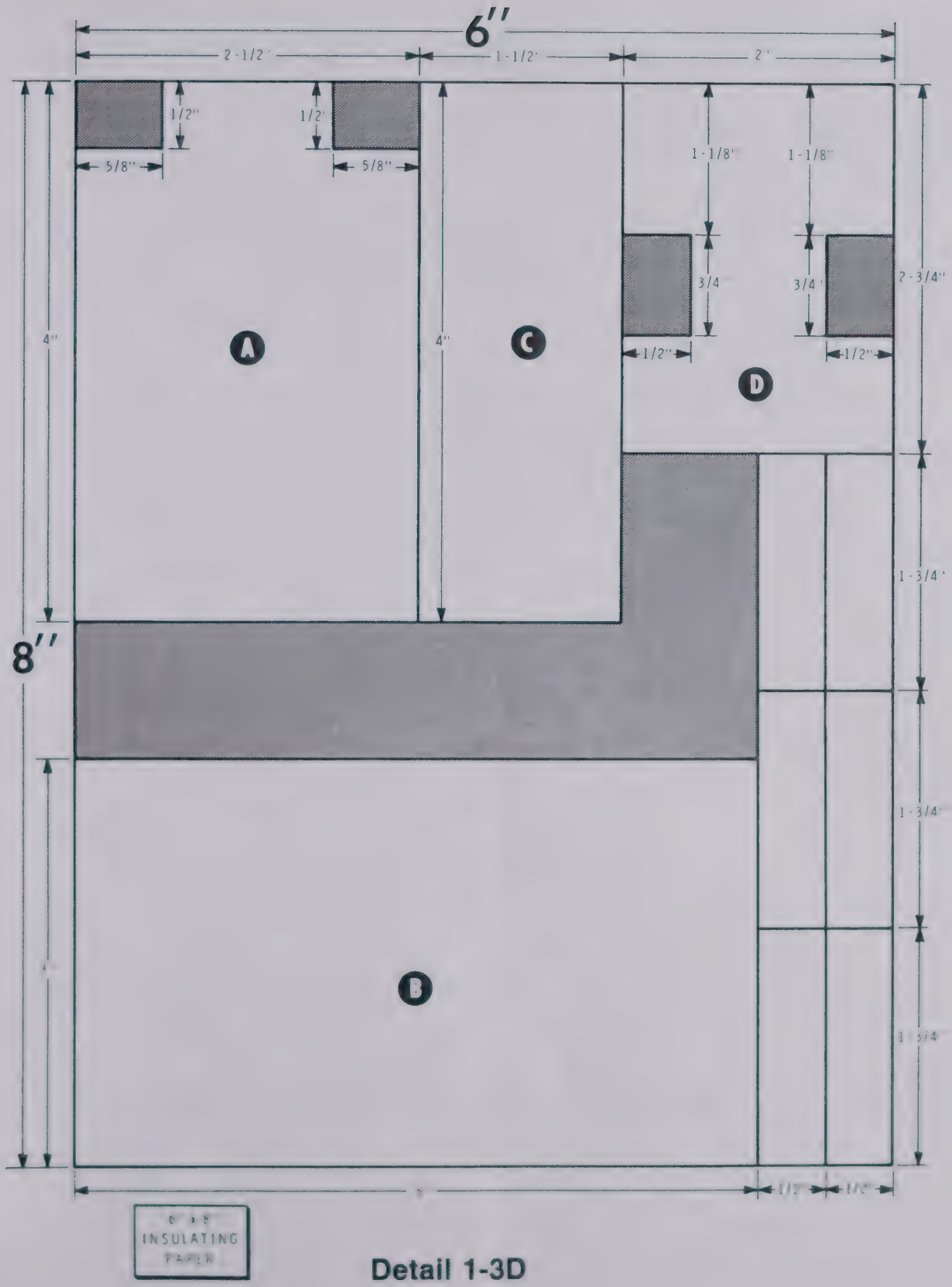
S13
S14
S15
HEATHKIT



PICTORIAL 1-1



PICTORIAL 1-3


6''
2 - 1/2''
1 - 1/2''
2''
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5/8''
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1 - 1/8''
1 - 1/8''
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2 - 3/4''
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A
C
D
1/2''
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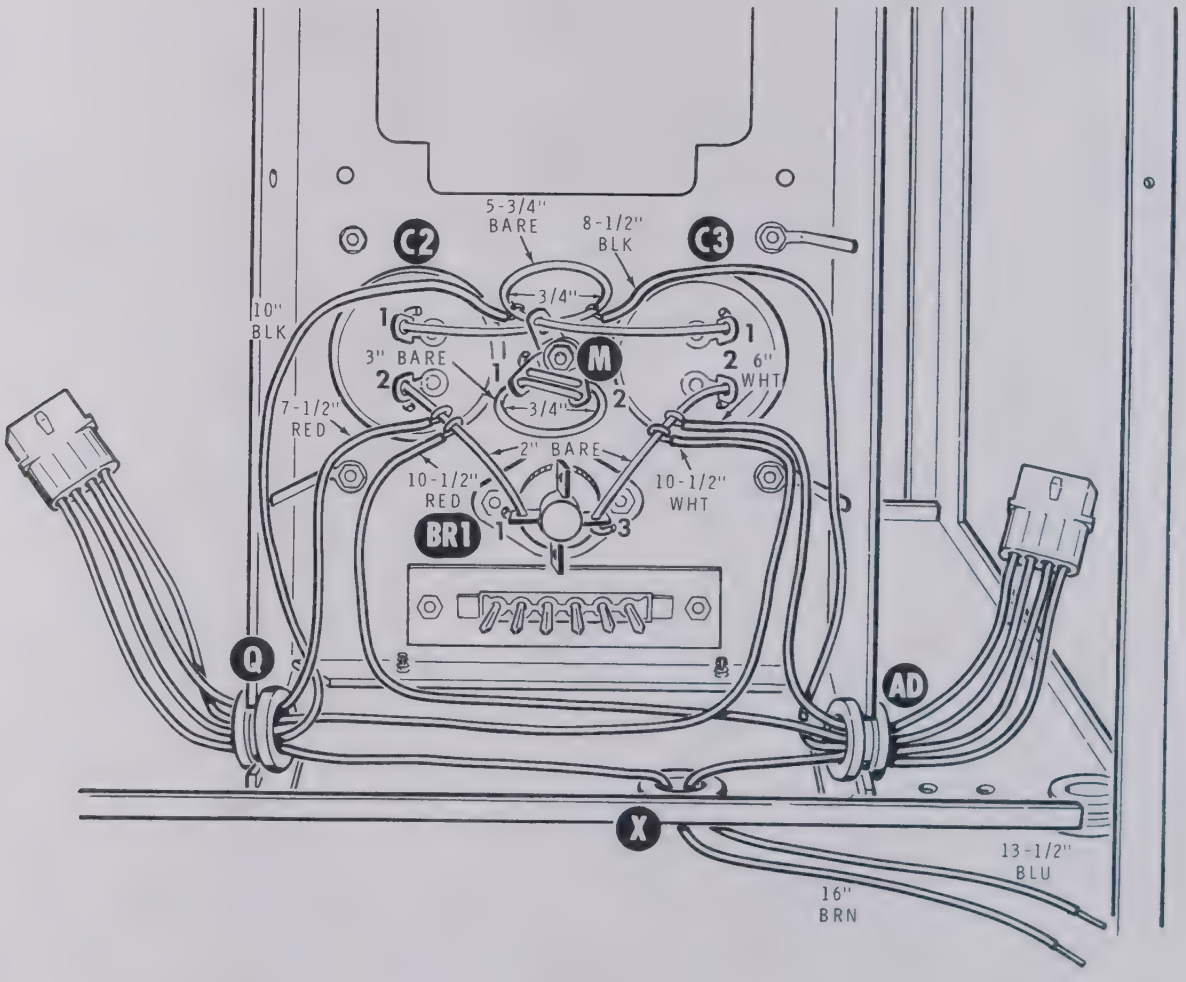
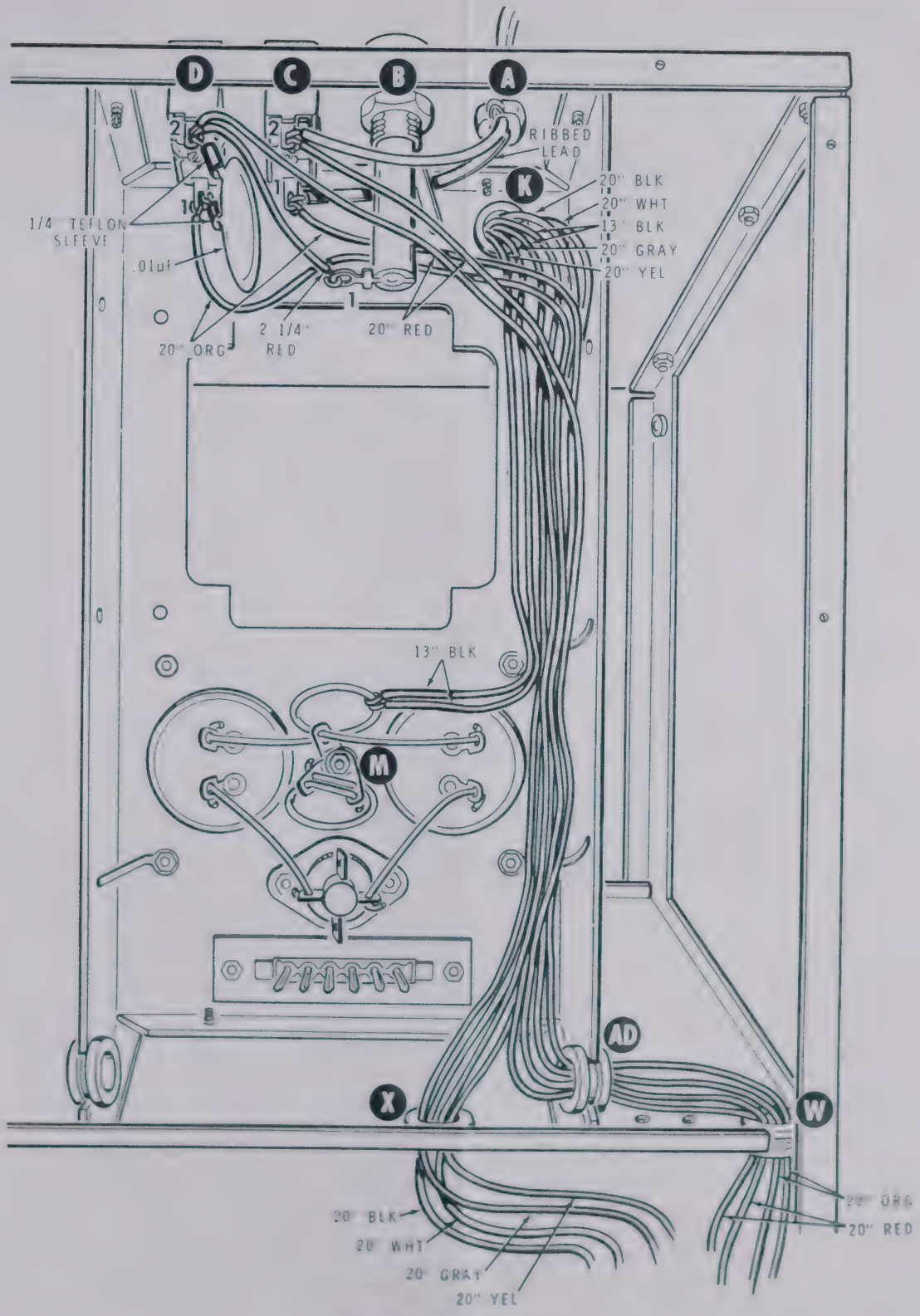
8''
1 - 3/4''
1 - 3/4''
B
1 - 3/4''
INSULATING
PAPER

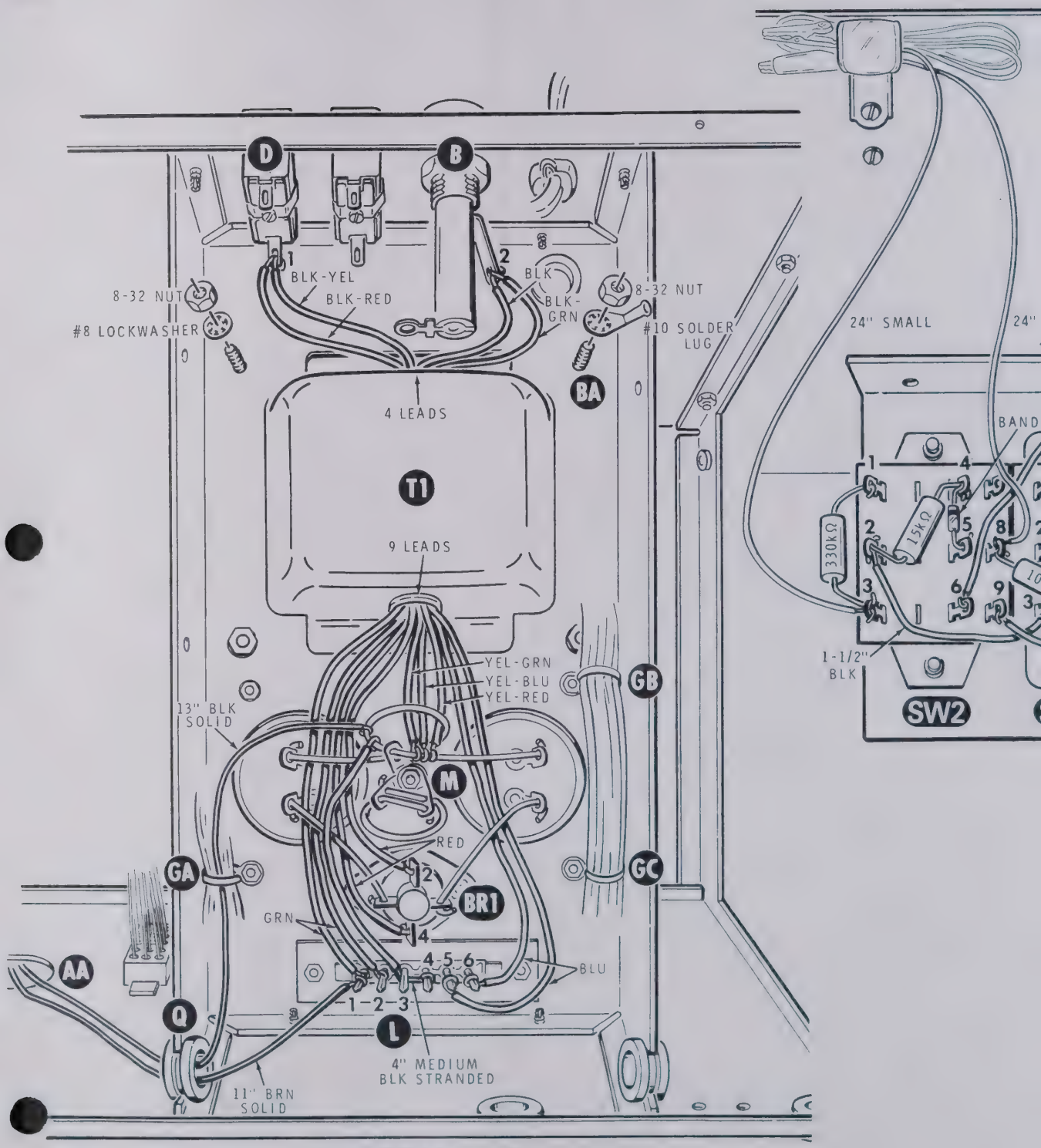
Detail 1-3D



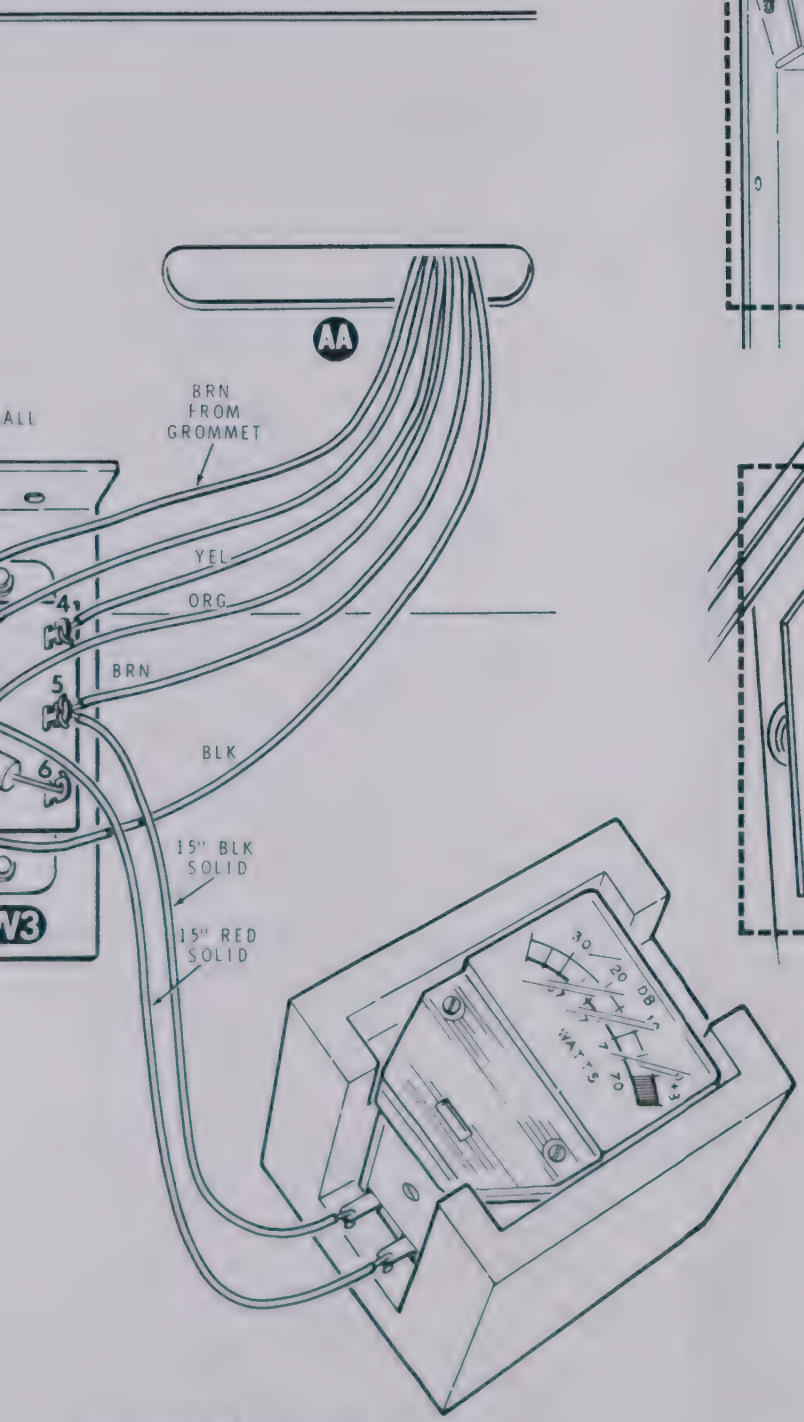
PICTORIAL 1-4



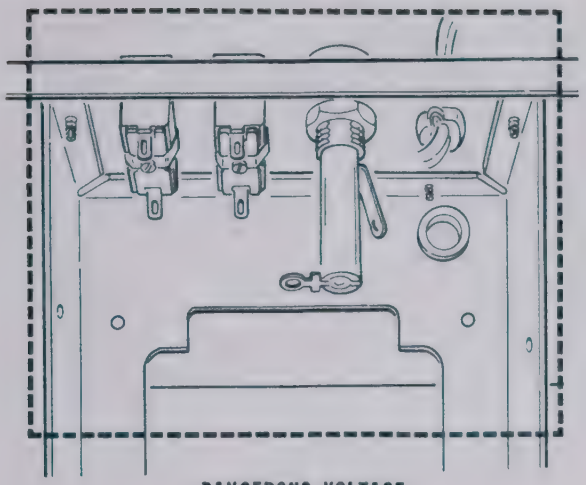
PICTORIAL 1-5



PICTORIAL 1-7



PICTORIAL 1-9



DANGEROUS VOLTAGE
AREAS

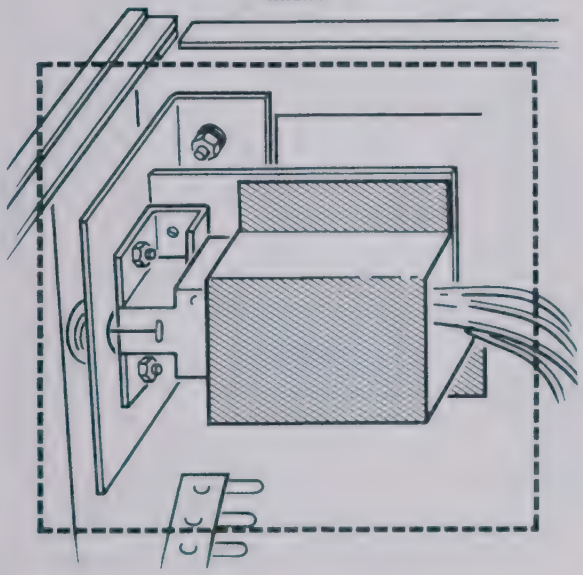
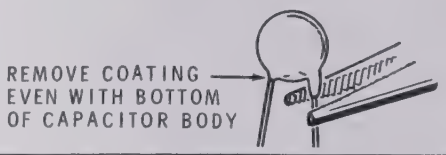
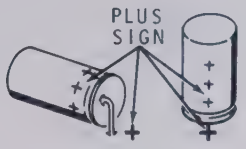


Figure 1-1

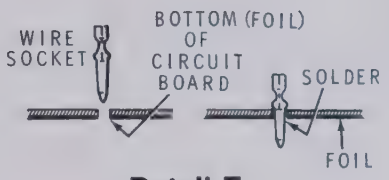
NOTE: WHEN YOU INSTALL DISC CAPACITORS, REMOVE ANY EXCESS COATING FROM THE LEADS. USE LONG-NOSE PLIERS TO REMOVE THE COATING.



Detail A

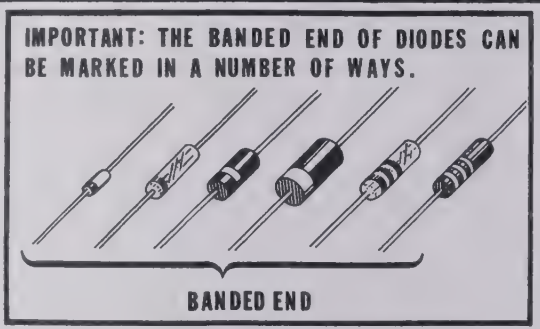


Detail D



Detail E

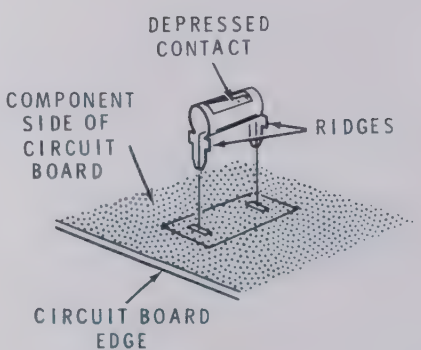
IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.



BE SURE YOU MATCH THE BANDED END OF THE DIODE WITH THE BAND ON THE CIRCUIT BOARD.

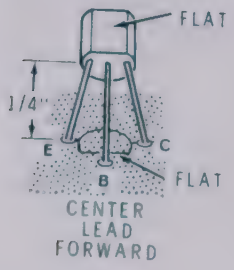
Detail B

Detail F

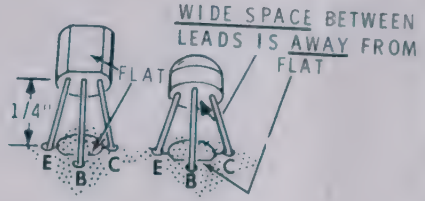


Detail C

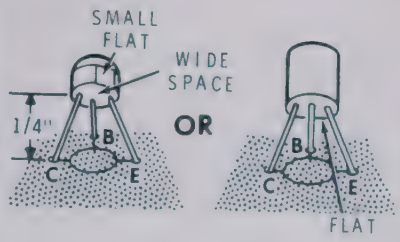
Detail G



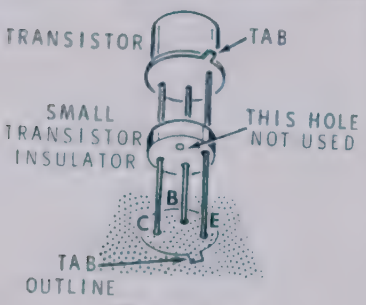
Detail H-1



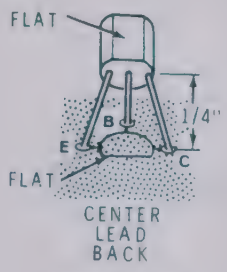
Detail H-2



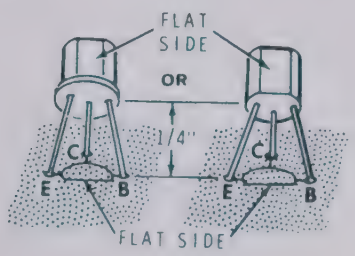
Detail H-3



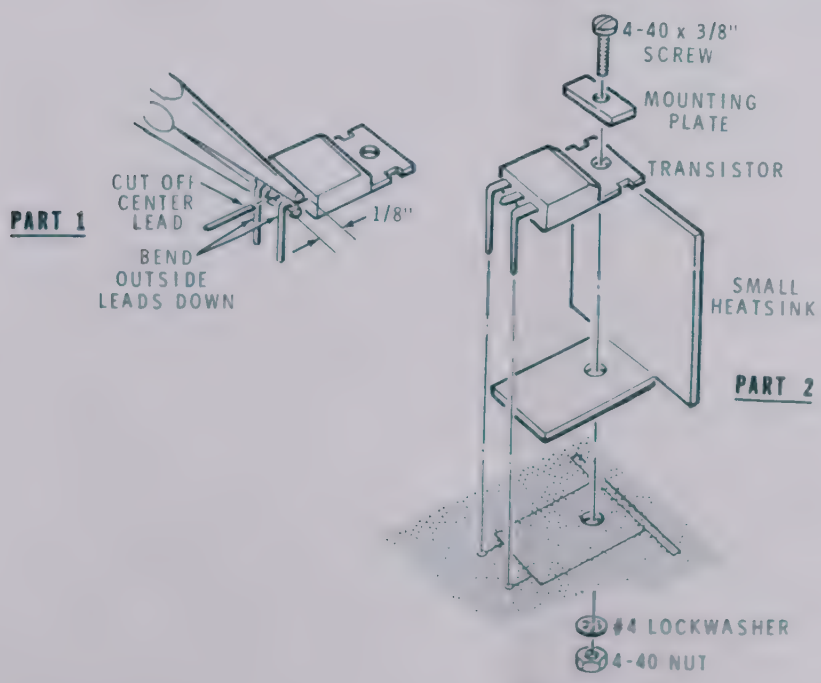
Detail H-4



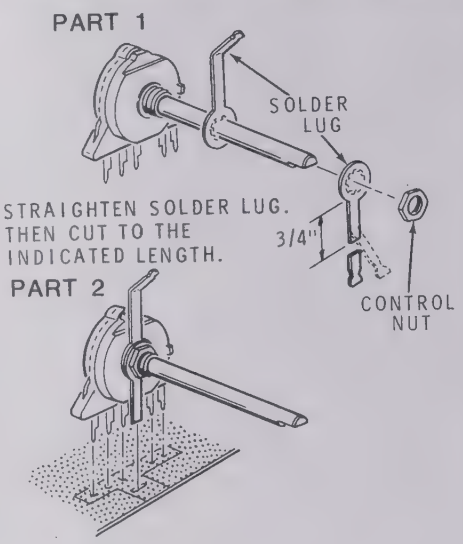
Detail H-5



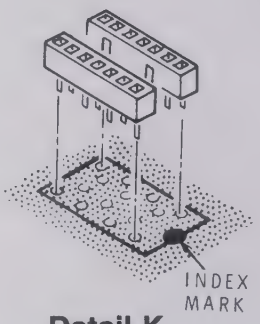
Detail H-6



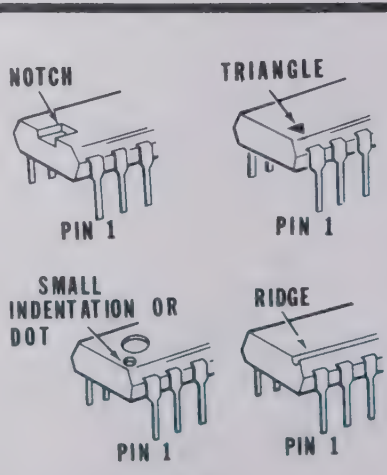
Detail H-7



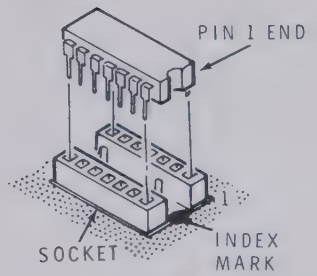
Detail J



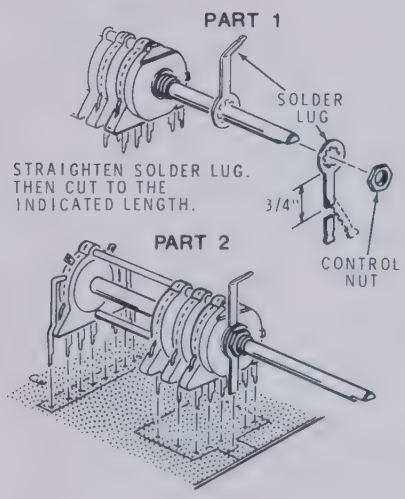
Detail K



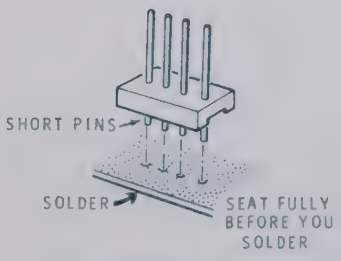
Detail L



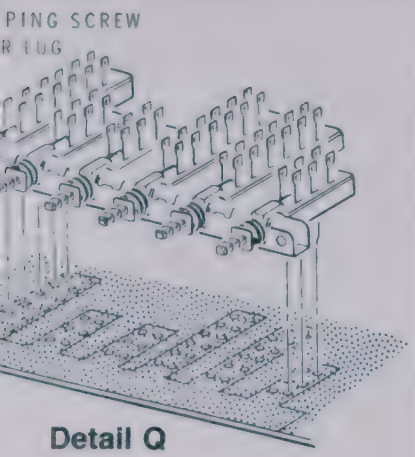
Detail M



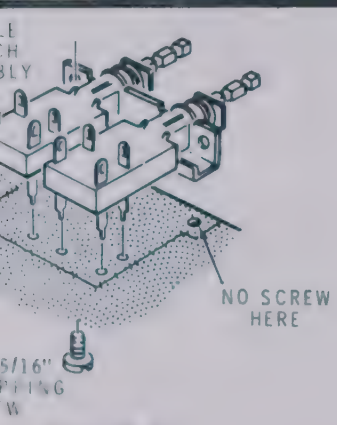
Detail N



Detail P

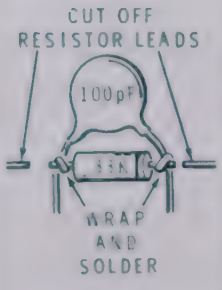


Detail Q

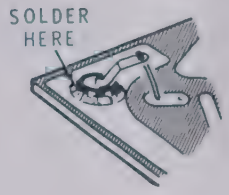


Detail R

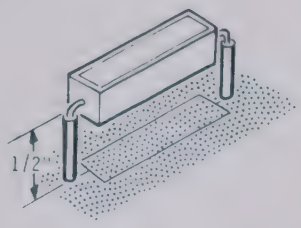
S



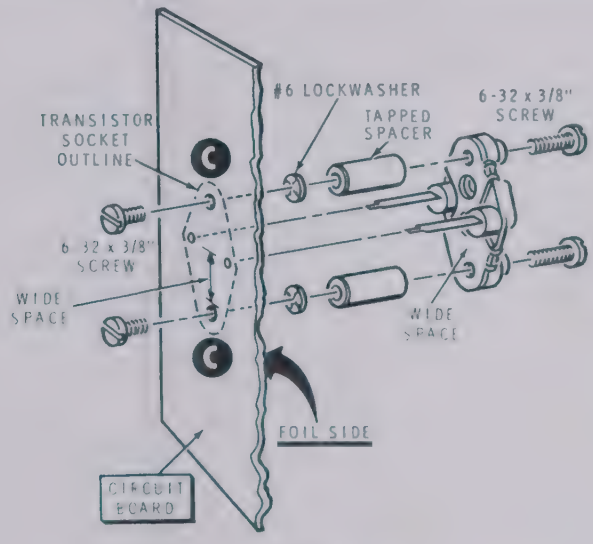
Detail T



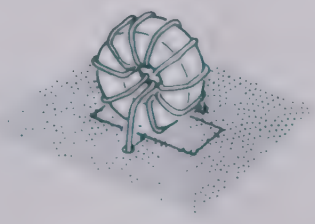
Detail U



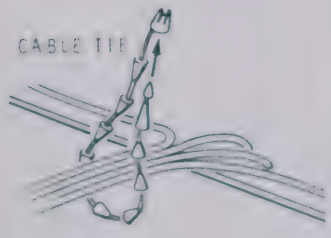
Detail V



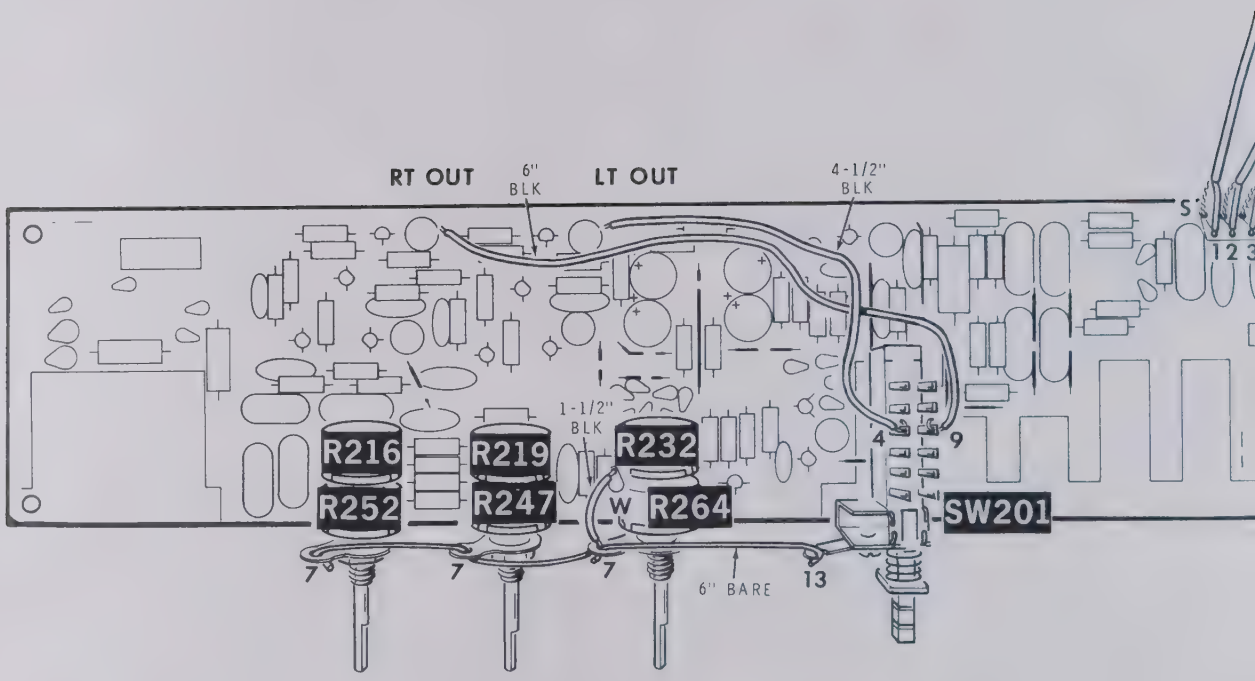
Detail X



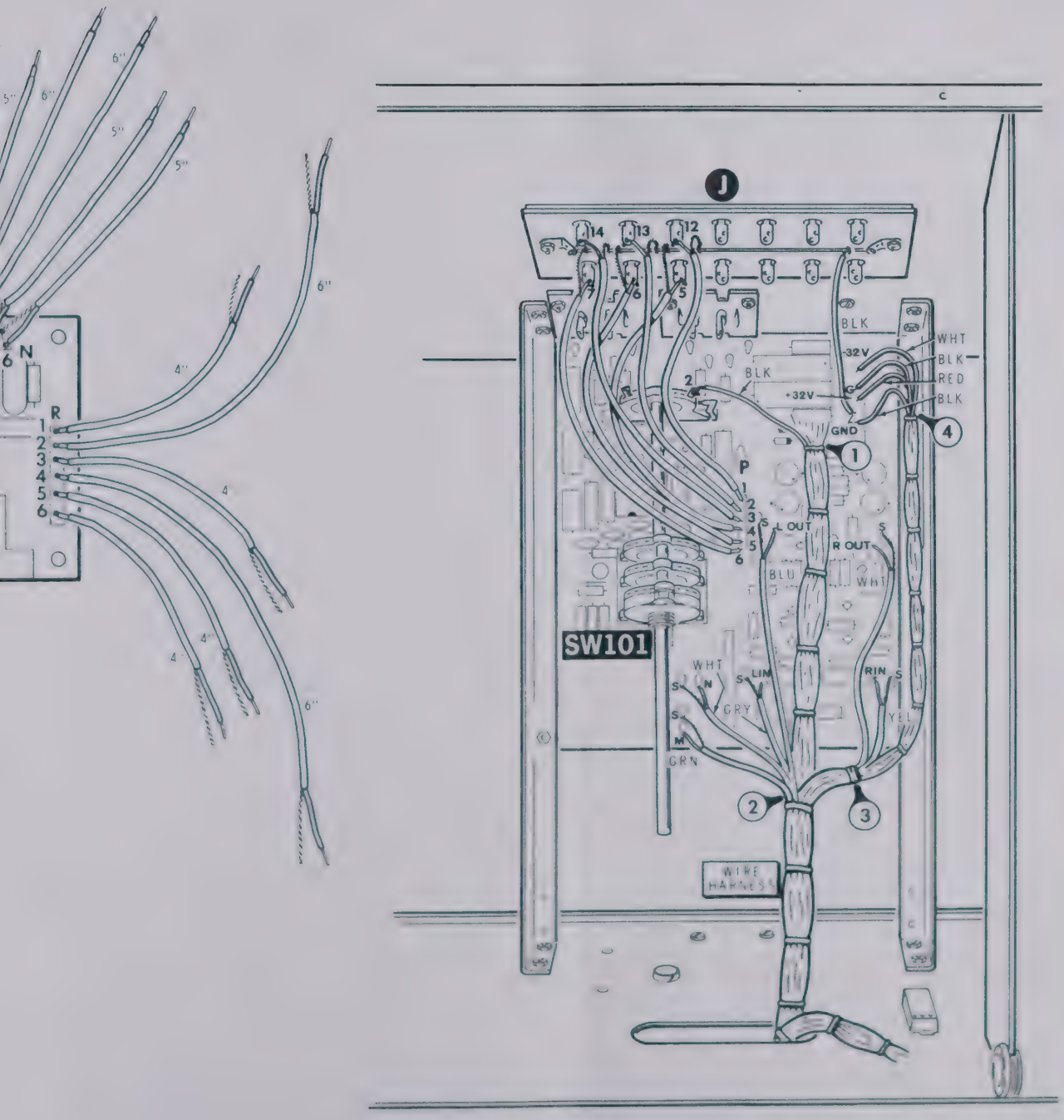
Detail W



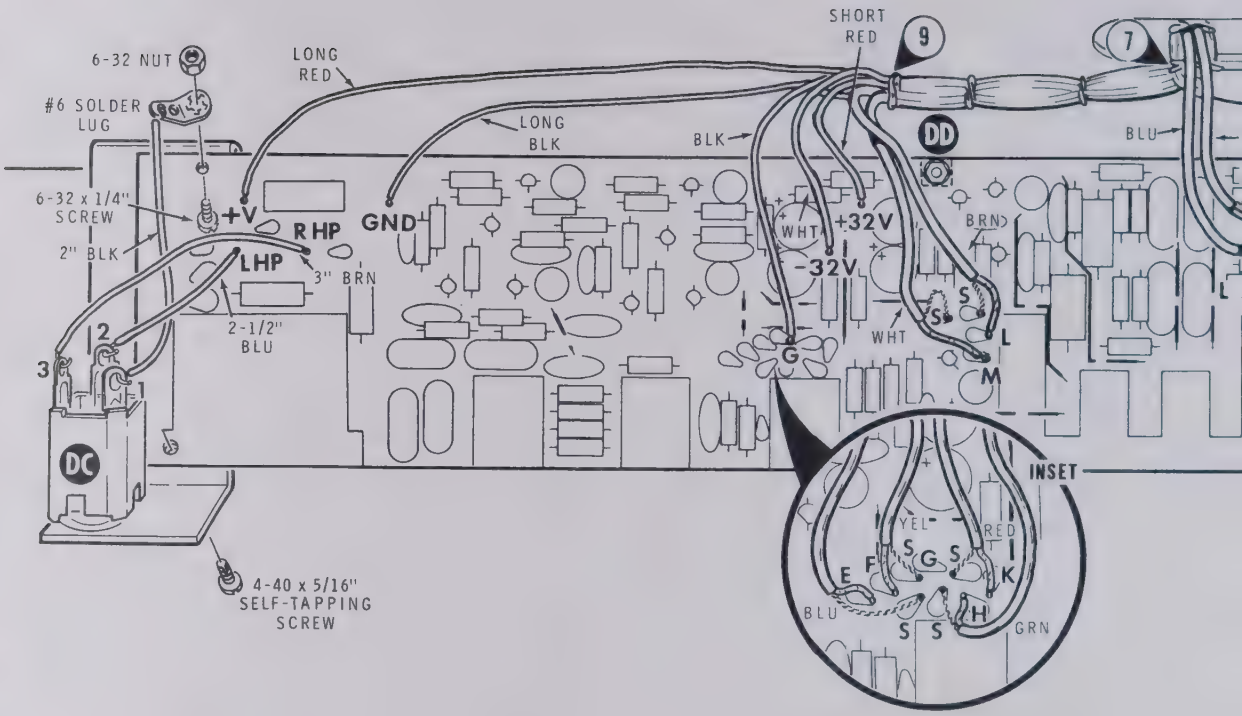
Detail Y



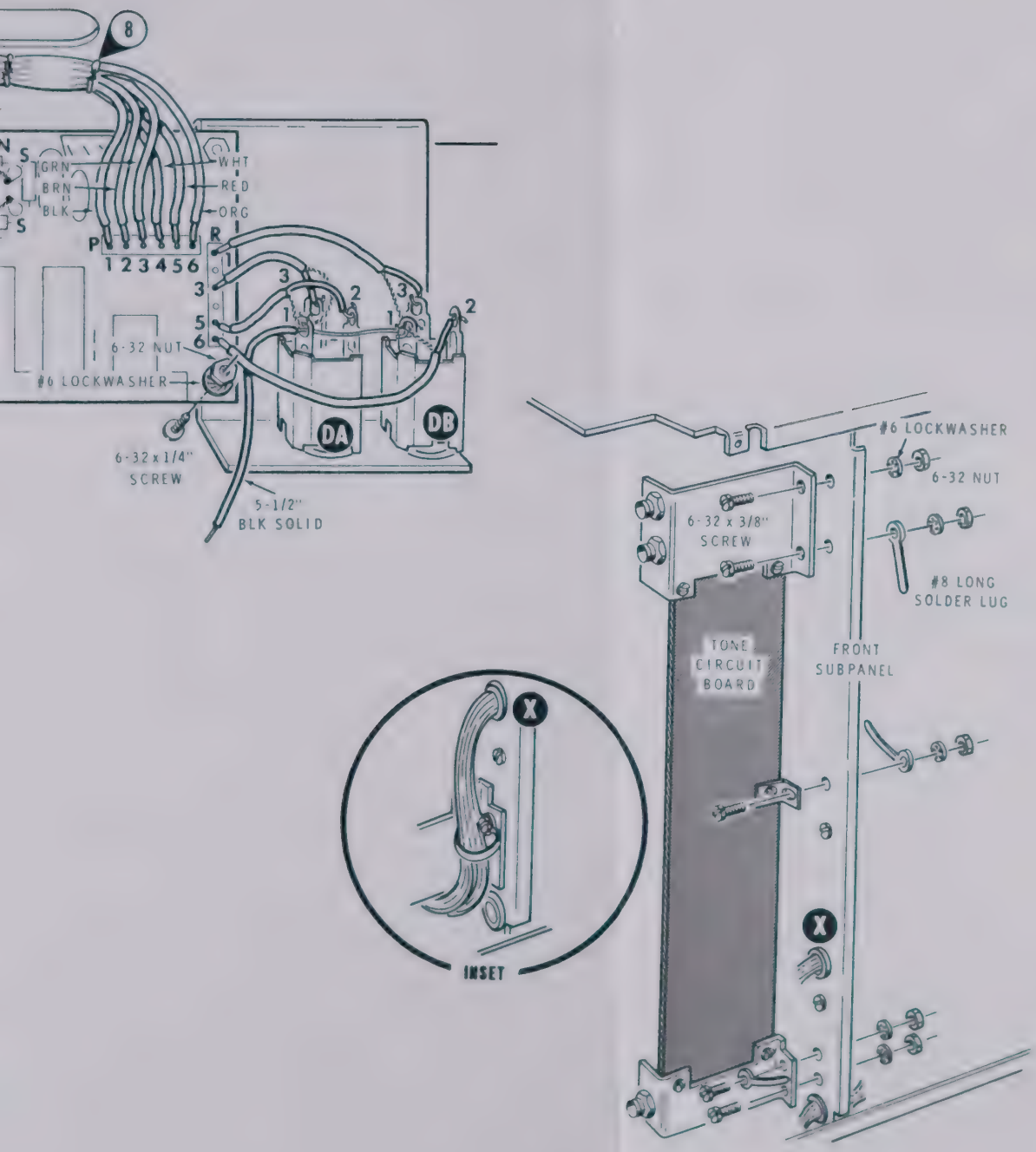
PICTORIAL 5-6



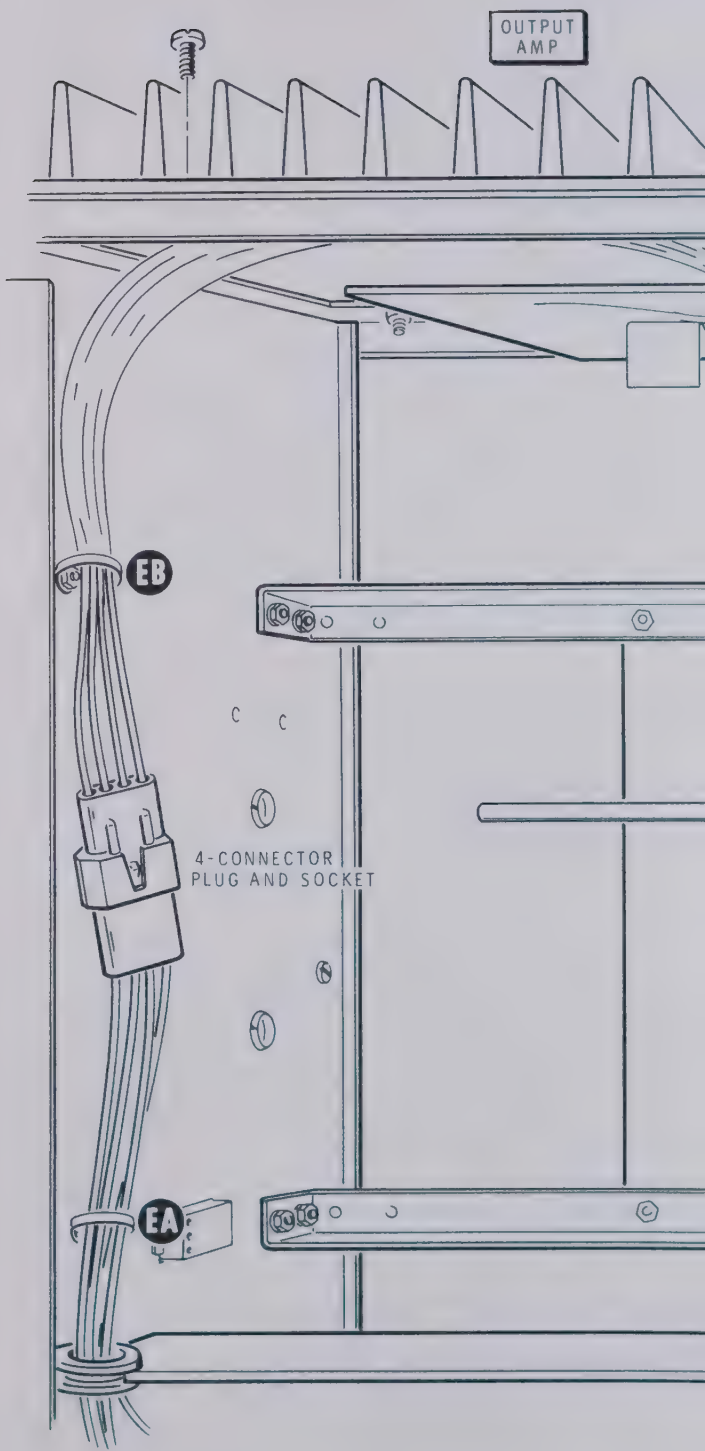
PICTORIAL 8-4

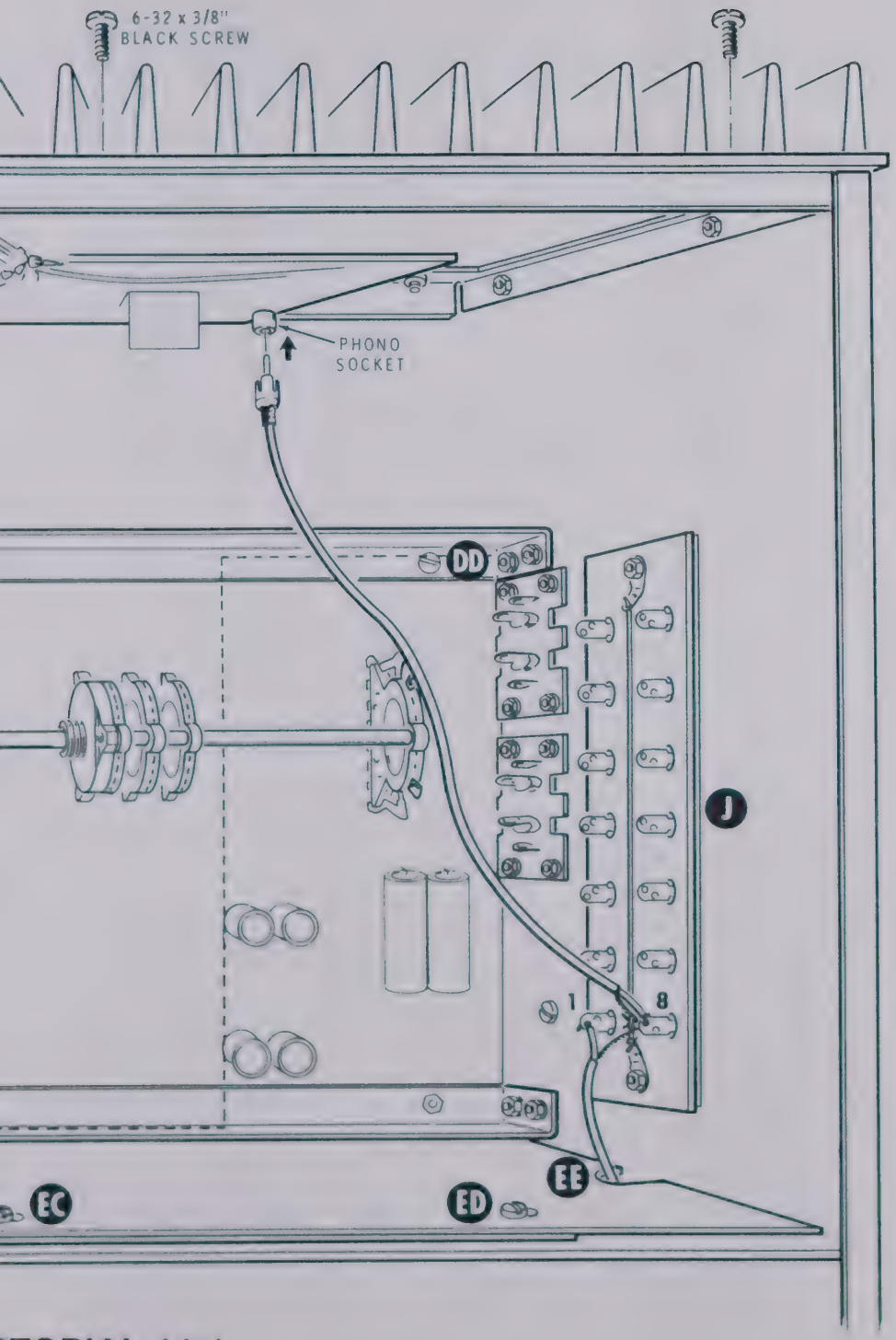


PICTORIAL 9-1

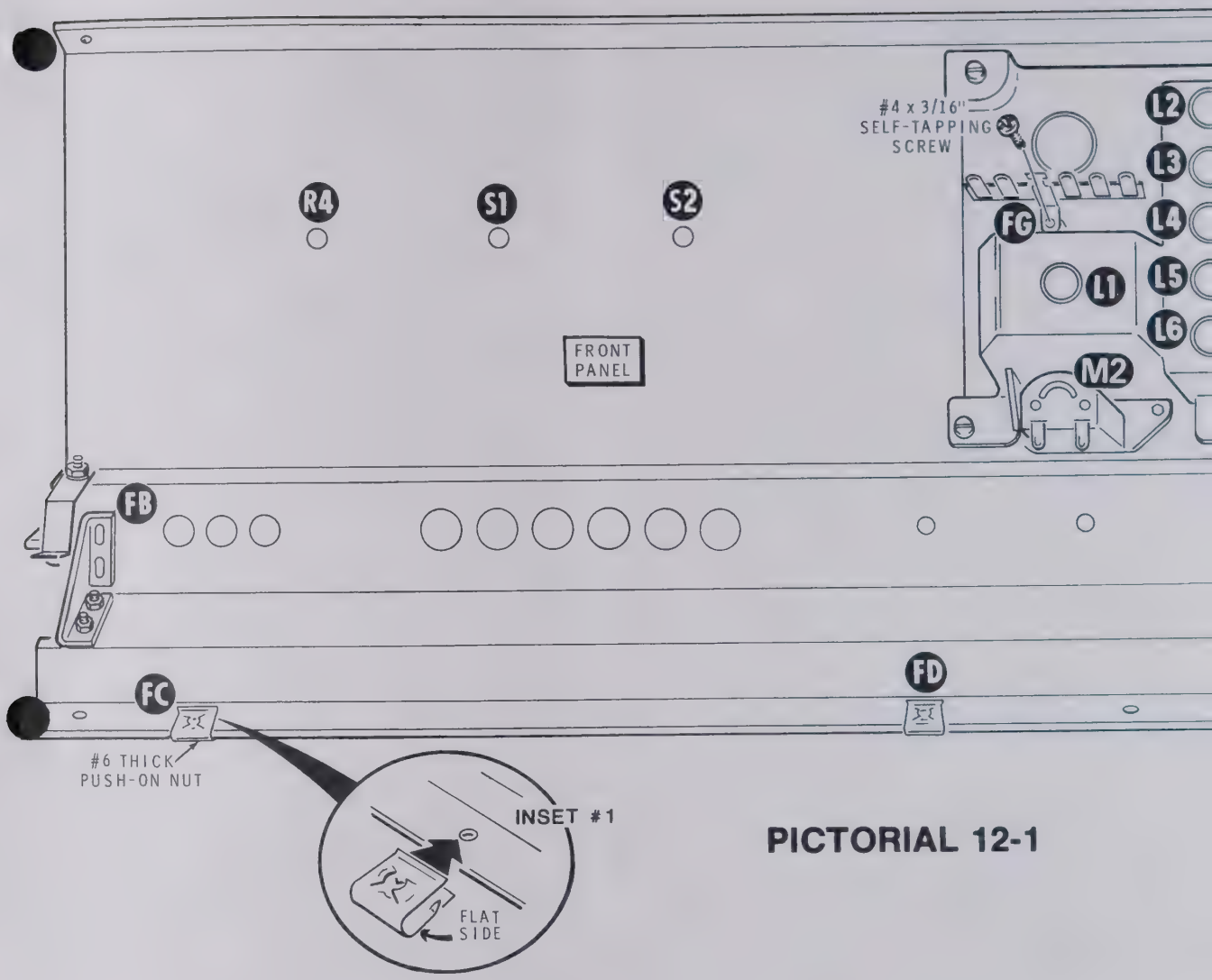

8
GRN
BRN
BLK
WHT
RED
ORG
P
R
1 2 3 4 5 6
3
5
6
6-32 NUT
#6 LOCKWASHER
6-32 x 1/4"
SCREW
5-1/2"
BLK SOLID
DA
DB
#6 LOCKWASHER
6-32 NUT
6-32 x 3/8"
SCREW
#8 LONG
SOLDER LUG
TONE
CIRCUIT
BOARD
FRONT
SUBPANEL
X
INSET

Detail 9-1D

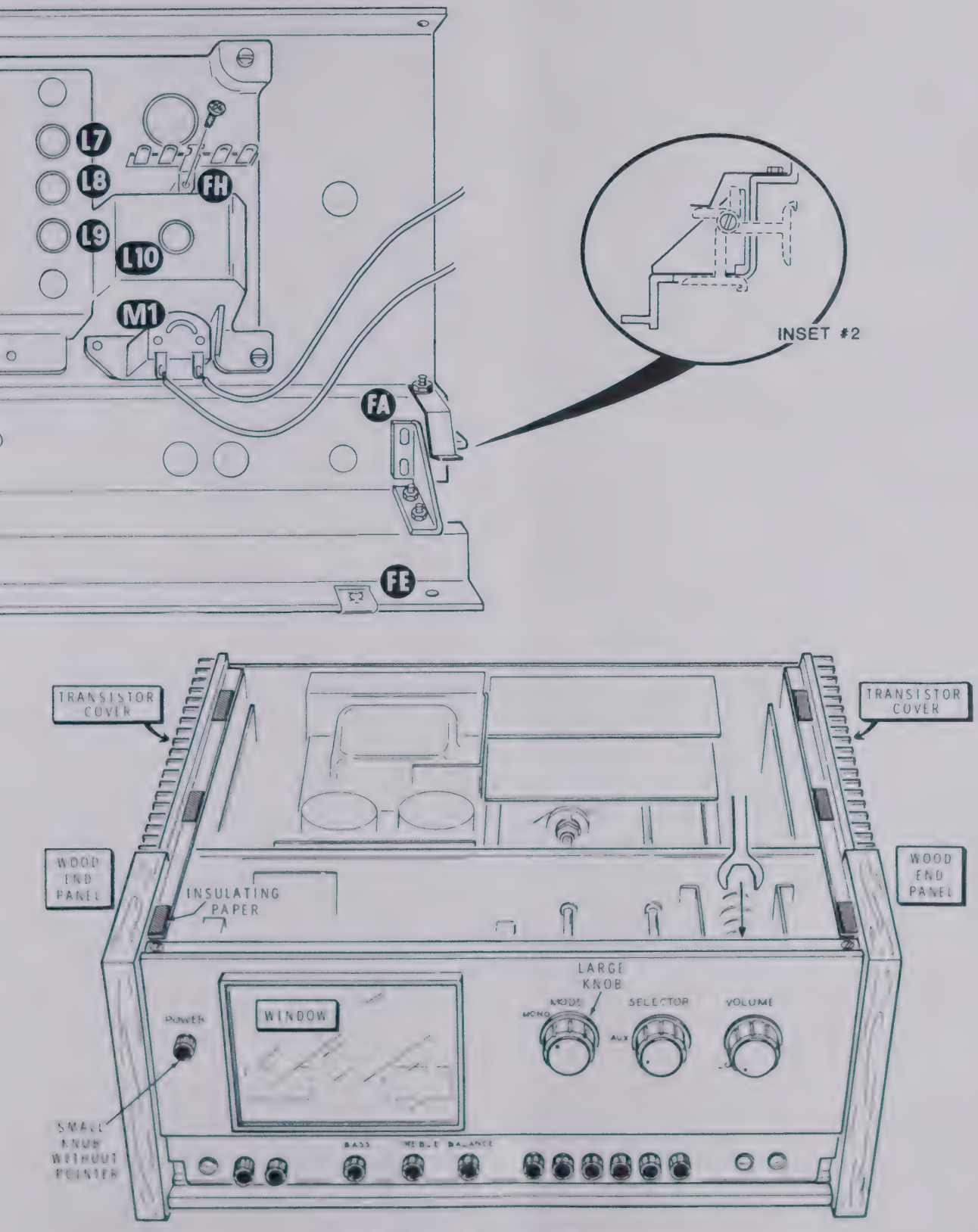

OUTPUT
AMP
EB
4-CONNECTOR
PLUG AND SOCKET
EA



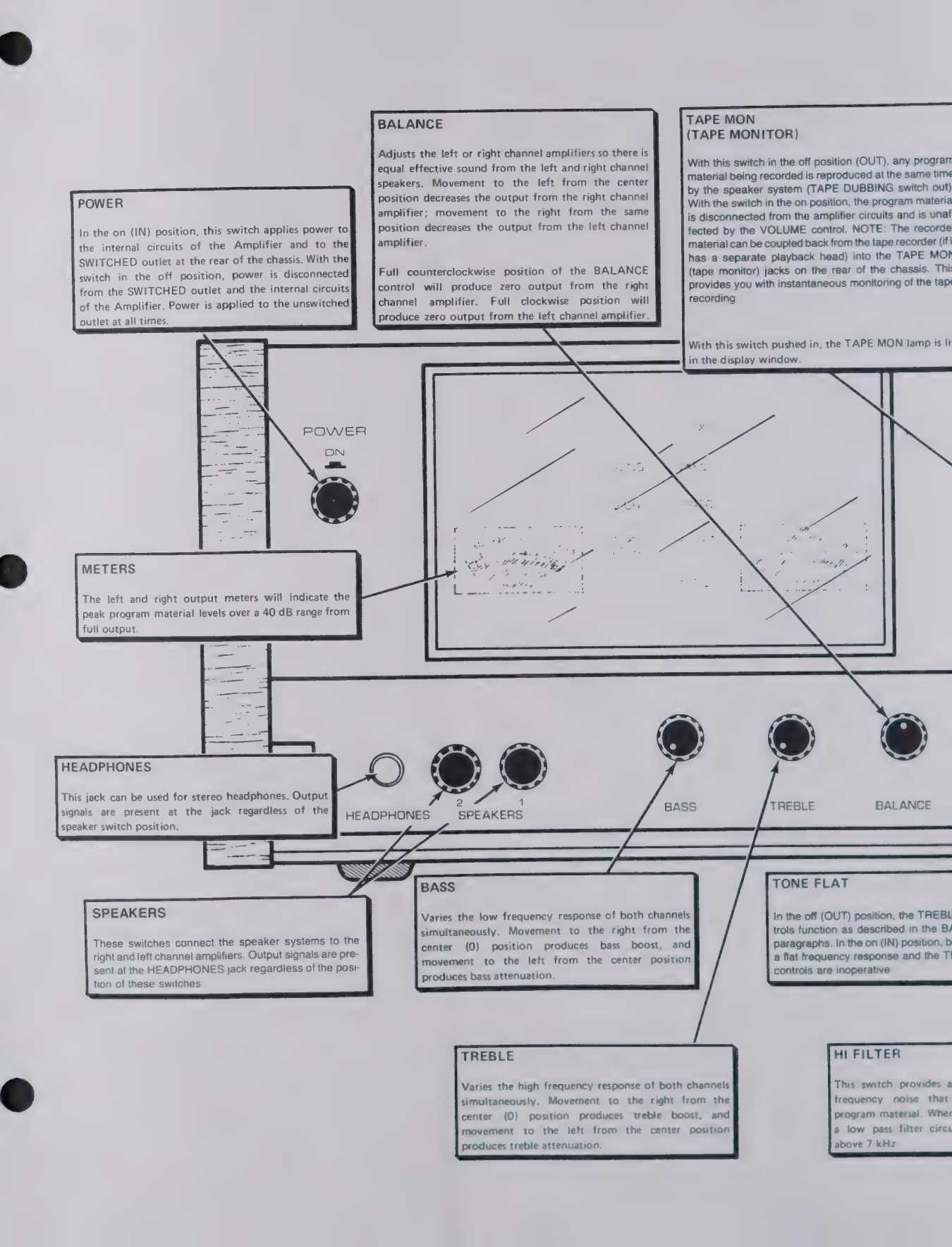
CTORIAL 11-1



PICTORIAL 12-1



PICTORIAL 12-6



POWER

In the on (IN) position, this switch applies power to the internal circuits of the Amplifier and to the SWITCHED outlet at the rear of the chassis. With the switch in the off position, power is disconnected from the SWITCHED outlet and the internal circuits of the Amplifier. Power is applied to the unswitched outlet at all times.

BALANCE

Adjusts the left or right channel amplifiers so there is equal effective sound from the left and right channel speakers. Movement to the left from the center position decreases the output from the right channel amplifier; movement to the right from the same position decreases the output from the left channel amplifier.

Full counterclockwise position of the BALANCE control will produce zero output from the right channel amplifier. Full clockwise position will produce zero output from the left channel amplifier.

TAPE MON (TAPE MONITOR)

With this switch in the off position (OUT), any program material being recorded is reproduced at the same time by the speaker system (TAPE DUBBING switch out). With the switch in the on position, the program materia is disconnected from the amplifier circuits and is unaf fected by the VOLUME control. NOTE: The recorde material can be coupled back from the tape recorder (if i has a separate playback head) into the TAPE MON (tape monitor) jacks on the rear of the chassis. This provides you with instantaneous monitoring of the tape recording

With this switch pushed in, the TAPE MON lamp is li in the display window.

METERS

The left and right output meters will indicate the peak program material levels over a 40 dB range from full output.

HEADPHONES

This jack can be used for stereo headphones. Output signals are present at the jack regardless of the speaker switch position.

SPEAKERS

These switches connect the speaker systems to the right and left channel amplifiers. Output signals are present at the HEADPHONES jack regardless of the position of these switches

BASS

Varies the low frequency response of both channels simultaneously. Movement to the right from the center (0) position produces bass boost, and movement to the left from the center position produces bass attenuation.

TONE FLAT

In the off (OUT) position, the TREBL trols function as described in the BA paragraphs. In the on (IN) position, b a flat frequency response and the TI controls are inoperative

TREBLE

Varies the high frequency response of both channels simultaneously. Movement to the right from the center (0) position produces treble boost, and movement to the left from the center position produces treble attenuation.

HI FILTER

This switch provides a frequency noise that program material. Wher a low pass filter circu above 7 kHz

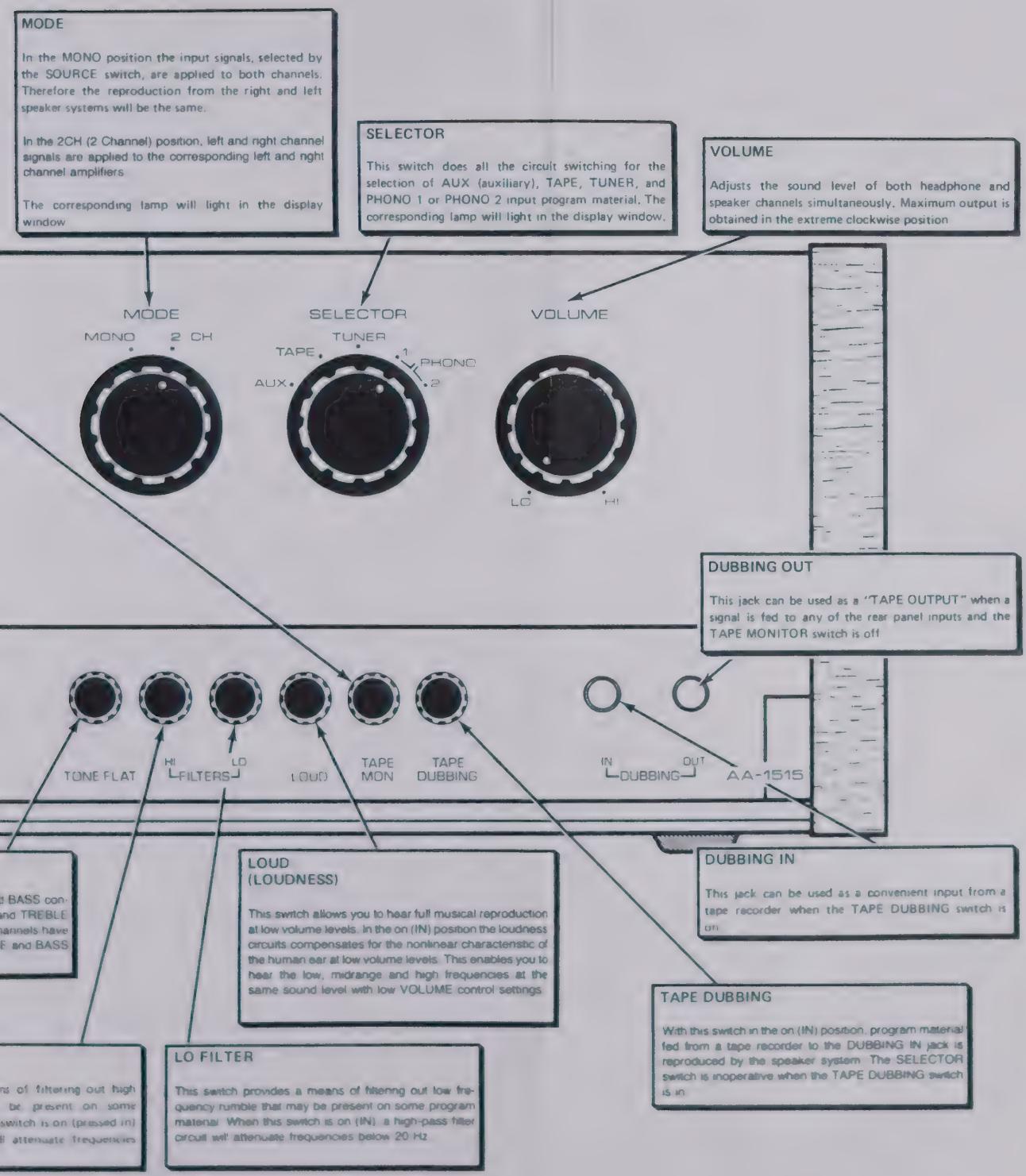
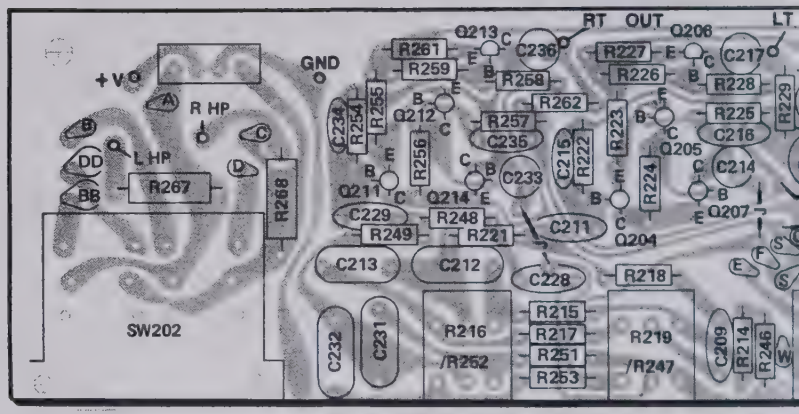
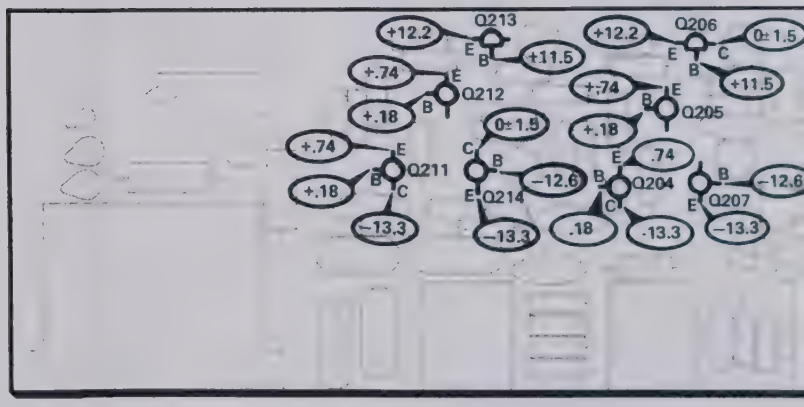

MODE
In the MONO position the input signals, selected by the SOURCE switch, are applied to both channels. Therefore the reproduction from the right and left speaker systems will be the same.
In the 2CH (2 Channel) position, left and right channel signals are applied to the corresponding left and right channel amplifiers.
The corresponding lamp will light in the display window.
SELECTOR
This switch does all the circuit switching for the selection of AUX (auxiliary), TAPE, TUNER, and PHONO 1 or PHONO 2 input program material. The corresponding lamp will light in the display window.
VOLUME
Adjusts the sound level of both headphone and speaker channels simultaneously. Maximum output is obtained in the extreme clockwise position.
MODE
MONO
2 CH
SELECTOR
TUNER
TAPE
AUX
PHONO
1
2
VOLUME
LO
HI
DUBBING OUT
This jack can be used as a "TAPE OUTPUT" when a signal is fed to any of the rear panel inputs and the TAPE MONITOR switch is off.
TONE FLAT
HI
LO
FILTERS
LOUD
TAPE MON
TAPE DUBBING
IN
OUT
DUBBING
AA-1515
LOUD (LOUDNESS)
This switch allows you to hear full musical reproduction at low volume levels. In the on (IN) position the loudness circuits compensates for the nonlinear characteristic of the human ear at low volume levels. This enables you to hear the low, midrange and high frequencies at the same sound level with low VOLUME control settings.
DUBBING IN
This jack can be used as a convenient input from a tape recorder when the TAPE DUBBING switch is on.
TAPE DUBBING
With this switch in the on (IN) position, program material fed from a tape recorder to the DUBBING IN jack is reproduced by the speaker system. The SELECTOR switch is inoperative when the TAPE DUBBING switch is in.
LO FILTER
This switch provides a means of filtering out low frequency rumble that may be present on some program material. When this switch is on (IN), a high-pass filter circuit will attenuate frequencies below 20 Hz.

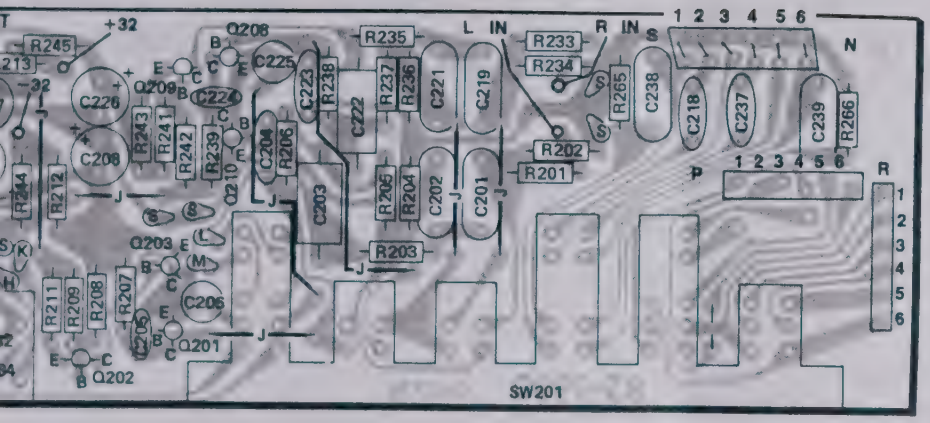
Figure 1-4



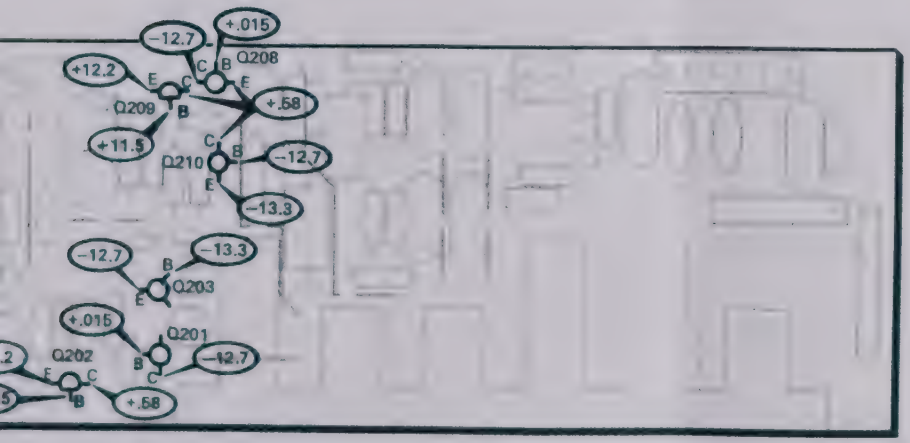
TONE
(Viewed fr



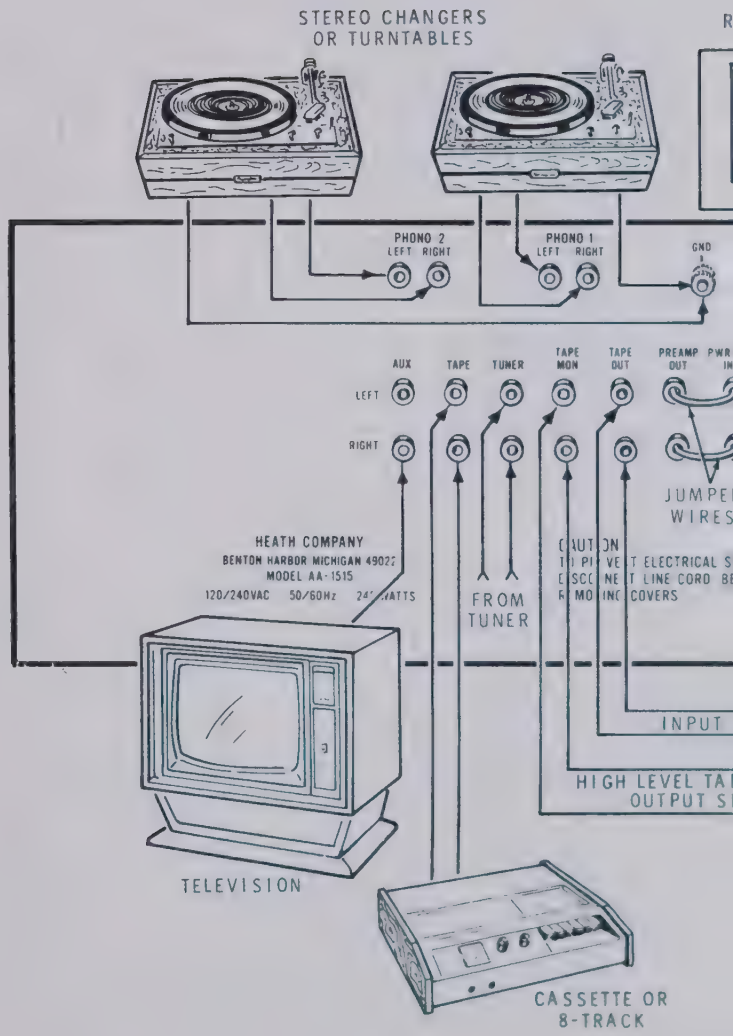
TONE C
(Viewed fro

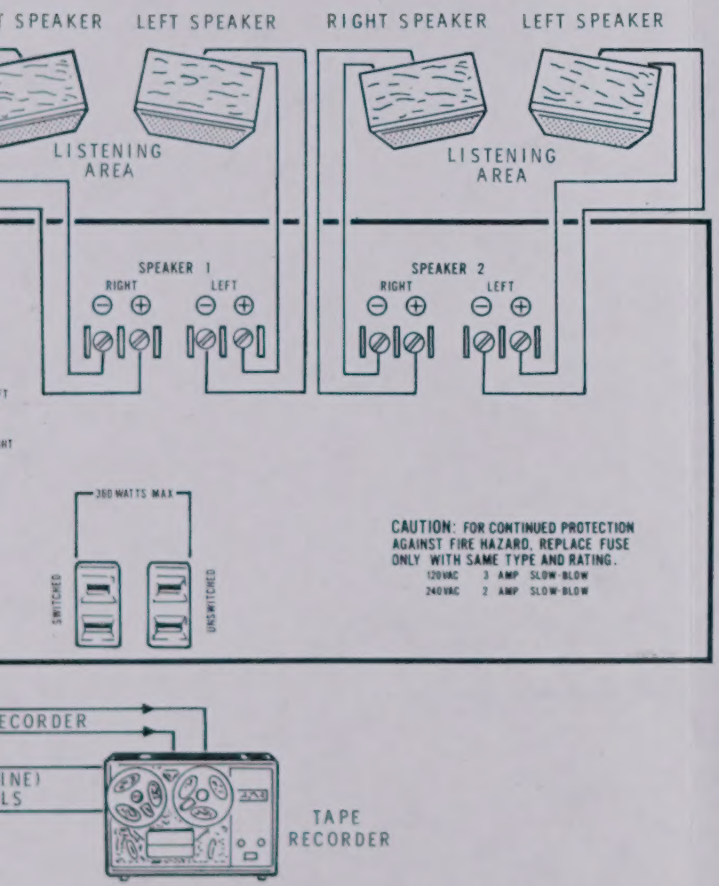


RCUIT BOARD
component side)



UIT BOARD
omponent side)


STEREO CHANGERS
OR TURNTABLES
PHONO 2
LEFT RIGHT
PHONO 1
LEFT RIGHT
GND
AUX
TAPE
TUNER
TAPE
MON
TAPE
OUT
PREAMP
OUT
LEFT
RIGHT
JUMPER
WIRES
HEATH COMPANY
BENTON HARBOR MICHIGAN 49022
MODEL AA-1515
120/240VAC 50/60Hz
FROM
TUNER
INPUT
TELEVISION
CASSETTE OR
8-TRACK


T SPEAKER
LEFT SPEAKER
RIGHT SPEAKER
LEFT SPEAKER
LISTENING AREA
LISTENING AREA
SPEAKER 1
RIGHT
LEFT
SPEAKER 2
RIGHT
LEFT
360 WATTS MAX
SWITCHED
UNSWITCHED
CAUTION: FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE FUSE ONLY WITH SAME TYPE AND RATING.
120VAC 3 AMP SLOW-BLOW
240VAC 2 AMP SLOW-BLOW

ECORDER
INE)
LS
TAPE RECORDER

Figure 1-5

MP MASTER
MA22959